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Record of Decision:

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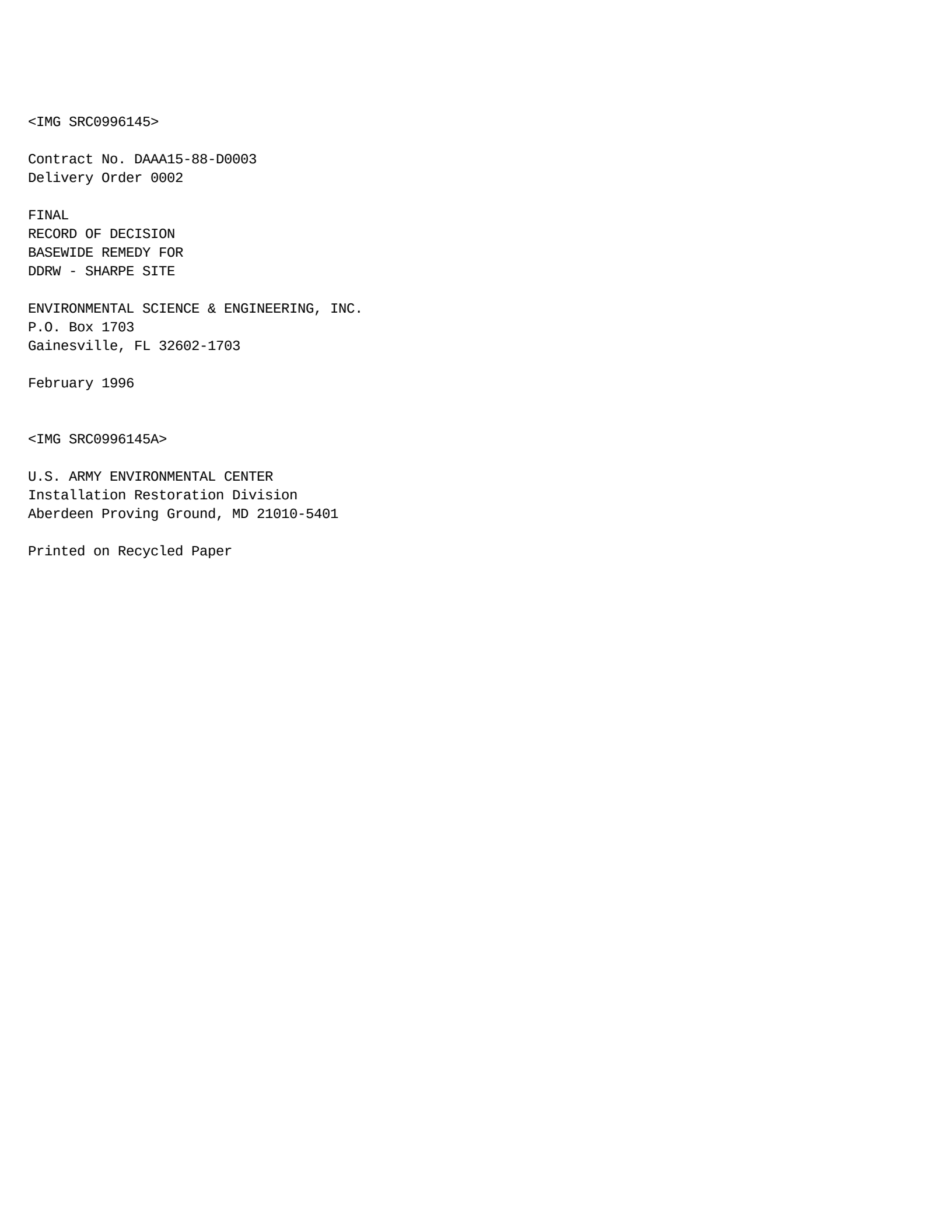

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FINAL
RECORD OF DECISION
BASEWIDE REMEDY FOR
DDRW - SHARPE SITE

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February 1996

U.S. ARMY ENVIRONMENTAL CENTER
Installation Restoration Division
Aberdeen Proving Ground, MD 21010-5401

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LIST OF ACRONYMS AND ABBREVIATIONS

AHA	Administration and Housing Area
BNA	Base-neutral/acid-extractable
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemicals of concern
CRL	cancer risk level
yd3	cubic yard
CVRWQCB	Central Valley Regional Water Quality Control Board
12DCE	1,2-dichloroethene
DDRW	Defense Distribution Region West
DOD	Department of Defense
DTSC	Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
freon	trichlorofluoromethane
FS	feasibility study
ft	foot
ft-bls	feet below land surface
ft-msl	feet above mean sea level
GPR	Ground-penetrating radar
HI	hazard index
ISV	in-situ volatilization
IWTP	industrial wastewater treatment plant
MCL	maximum contaminant level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
NPDES	National Pollutant Discharge Elimination System
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
OU1	operable unit 1
PAHs	polynuclear aromatic hydrocarbons
PID	photoionization detector
ppm	parts per million
PVC	polyvinyl chloride
QA	quality assurance
RA	Risk Assessment
RAGS	Risk Assessment Guidance for Superfund
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SHARPE	Sharpe Site
SJCPD	San Joaquin County Department of Planning and Building 2

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued, Page 2 of 2)

SSJIDC	South San Joaquin Irrigation District Canal
SVE	soil vapor extraction
SWMU	solid waste management unit
TBC	to be considered
TCE	trichloroethylene
TCLP	toxicity characteristic leaching procedure
TMV	toxicity, mobility, or volume
TSDF	treatment, storage, or disposal facility
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USFWS	U.S. Fish and Wildlife Service
USTs	underground storage tanks
VES	vapor extraction system
VOAs	volatile organic analytes
VOCs	volatile organic compounds
WDC	Western Distribution Center
XRF	X-ray fluorescence
yd3	cubic yard

DECLARATION FOR THE RECORD OF DECISION (ROD)

SITE NAME AND LOCATION
Defense Distribution Region West-Sharpe Site
Lathrop, California

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Defense Distribution Region West (DDRW)-Sharpe Site (SHARPE), in Lathrop, California, developed in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by Superfund Amendments and Reauthorization Act (SARA) to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and Chapter 6.8 of the California Health and Safety Code. Further, these actions are also being taken in response to the California Water Code. This decision is based on the administrative record for this site.

The U.S. Environmental Protection Agency (EPA) and the State of California concur on the selected remedies.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response actions selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

This Base-Wide ROD selects the remedy for the second operable unit (OU2) at Sharpe. OU2 addresses the comprehensive cleanup of soil, including the removal and offsite disposal of certain soils contaminated with lead and chromium; onsite treatment via in-situ volatilization (ISV) using vacuum extraction of certain soils contaminated with trichloroethylene (TCE); and no further action (NFA) for 111 Solid Waste Management Units (SWMUs). OU2 is intended to be the final response action for SHARPE. The first operable unit (OU1) addressed the contaminated groundwater; the selected remedy is set forth in the OUI ROD which was finalized in January 1993.

The OU2 selected remedy for lead- and chromium-contaminated soil is excavation and disposal offsite and includes:

1. Sampling to delineate soils contaminated with lead or chromium in excess of cleanup standards;
2. Removal of existing pavement, concrete, and light brush at locations with soils contaminated with lead and chromium at levels exceeding cleanup standards;
3. Excavation of soils that exceed cleanup standards;
4. Analyze excavated soils to determine if any soils are hazardous by characteristic;
5. If any portion of soils are determined to be hazardous by characteristic, then transport soils to an appropriately permitted offsite treatment, storage, or disposal facility (TSDF);
6. Transport non-hazardous soils to an appropriately permitted offsite landfill;
7. Complete confirmation sampling to ensure that soils with lead and chromium concentrations greater than cleanup standards have been removed;
8. Backfill excavations with clean fill so as to return the site to the existing grade; and
9. Evaluation of residual concentrations in soils and potential impact to groundwater.

The OU2 selected remedy for TCE-contaminated soil is ISV and includes:
1. Delineating areas suspected of being sources of groundwater contamination using soil gas data;
2. Using ISV to induce airflow from the subsurface soils to a vapor extraction point at locations determined to be impacting groundwater above the current cleanup standards; and
3. Transmitting ISV offgases from the vapor extraction point to a system that will treat air prior to discharging it into the atmosphere.

The OU2 selected remedy for the 111 SWMUs is NFA.

A dispute was invoked concerning the cleanup of VOCs in the vadose zone and concerning the fate of residual metals. The Dispute Resolution Committee resolved this dispute as reflected in Sections 9.2 et seq. and 9.1.4, respectively. The resolutions are negotiated solutions, based on site specific conditions and therefore not generally applicable to other sites. Where language elsewhere in the ROD is not consistent with these negotiated resolutions, the language in the above specified Sections prevails.

STATUTORY DETERMINATIONS

The selected remedies are protective of human health and the environment, comply with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and are cost effective. These remedies use permanent solutions and satisfy the statutory preference for remedies that employ treatment and reduce toxicity, mobility, or volume as a principal element.

A 5-year review, as required, will be conducted in accordance with CERCLA Section 121(e).

<IMG SRC 0996145B>

DECISION SUMMARY

1.0 SITE NAME, LOCATION, AND DESCRIPTION

SHARPE is located northeast of Lathrop, California, east of Interstate 5 and west of California Highway 99, with Roth and Lathrop Roads paralleling and contiguous to the north and south boundaries of the site, respectively. The South San Joaquin Irrigation District Canal (SSJIDC) parallels the eastern boundary. Land around SHARPE is used for a variety of purposes including residential, agricultural, and light industry. A site map is presented as Fig. 1-1.

SHARPE lies on slightly sloping to flat land. Elevations generally vary between 16 and 23 feet above mean sea level (ft-msl). Most of the surface water runoff is routed into drains leading to the stormwater sewer system and then into the SSJIDC at the east side of the site. This canal discharges into French Camp Slough a few miles north of SHARPE. French Camp Slough discharges into the San Joaquin River, which flows into San Francisco Bay. No surface water runoff occurs on the west boundary of SHARPE; surface water along this boundary drains into sumps 5- to 15-feet (ft) deep located along the west fence line and is allowed to percolate.

No discernible evidence exists to indicate faulting or geologic structures influence groundwater flow patterns. Groundwater flow along the western boundary of SHARPE is generally northwestward.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

SHARPE was established in 1941. Construction of the major facilities at SHARPE began during World War 11 and continued into the post-war period. Additional facilities were constructed during the Korean and Vietnam Conflicts. The Western Distribution Center (WDC), constructed in 1988, represents the most recent significant construction activity at SHARPE. For most of its existence, the installation has had both supply and maintenance missions. The supply mission remains active and includes storage, handling, preservation, packaging, and shipment of general supplies and equipment. The maintenance mission at one time included repair and reconditioning of both heavy equipment and aircraft. The heavy equipment mission began in the late 1940s, and the aircraft mission was added in 1957. These missions were discontinued in 1976. The major waste-generating activities from these operations were paint stripping, metal finishing, and painting. Other activities included engine overhauls, hydraulic and electric repairs, airframe and body work, and component repair and reconditioning. Since 1976, the maintenance mission has included only maintenance of installation facilities and vehicles used in performing the supply mission.

<IMG SRC 0996145C>

Soil and groundwater contamination were first detected at SHARPE in 1982. In 1982, the U.S. Army Environmental Center [USAEC, formerly the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA)] initiated a Remedial Investigation (RI). Early RI work indicated groundwater, contamination with offpost migration of VOCs. Base-neutral/acid-extractable (BNA) compounds and nitrates were also investigated during the early phases of the RI and were found not to be chemicals of concern (COCs). Additionally, arsenic, selenium, and bromacil have been detected sporadically in groundwater samples. Available data indicate that the primary source of VOC contamination is associated with past mission-related activities (e.g., vehicle maintenance) at SHARPE.

As a result of early investigations conducted at SHARPE, an interim groundwater extraction and treatment system (referred to as the South Balloon Area Groundwater Treatment System) was put into operation in March 1987 to control migration of contaminated groundwater in that portion of the site. A separate interim RI and feasibility study (FS) was also prepared to identify and evaluate interim remedial action alternatives in the North Balloon Area. As a result of this

investigation, a second interim groundwater pump-and-treat system was constructed in the North Balloon Area. This system began operation in October 1990. The agencies reviewed and informally approved the design and construction of the interim systems.

The RI was finalized in June 1991. Following this, USAEC prepared a Groundwater FS to evaluate alternatives for remediating VOC-contaminated groundwater. This FS was finalized in November 1991. The Proposed Plan for groundwater was released to the public on Feb. 6, 1992, and the Public Meeting was held on Feb. 27, 1992.

The January 1993 ROD for groundwater was designated operable unit 1 (OU1) and addressed VOCs, arsenic, selenium, bromacil, and nitrates in groundwater. Construction of the third and last groundwater treatment plant, located in the Central Area, was completed in May 1995, when it was put into operation. Groundwater treatment in the South Balloon Area, North Balloon Area, and Central Area is being conducted in accordance with the January 1993 ROD.

Work on the Soils FS, which addressed TCE-contaminated soils, lead- and chromium-contaminated soils, and NFA sites, was finalized in December 1994. The Proposed Plan for OU2 was released to the public on February 22, 1995; the Public Meeting was held on March 1, 1995.

Limited soil remediation has been conducted to date. ISV via vacuum extraction is currently being conducted as part of a long-term pilot test in the South Balloon Area and North Balloon Area. Additionally, pesticide-contaminated (DDT and chlordane) soils from the North Balloon Area have been excavated and disposed of in an appropriately licensed offs1te landfill. That action, documented in a Removal Action Memorandum finalized October 1994, was completed in March 1995. In December 1992, approximately 3,000 yd3 of soils contamination with petroleum constituents were excavated from the North Balloon Area and transported to an appropriately-licensed offsite landfill, in accordance with Title 23 CCR, Div. 3, Chapter 15, Article 2 requirements.

Other actions have also been completed at SHARPE. A total of 26 non-fuel underground storage tanks were identified during the initial phases of CERCLA work conducted at SHARPE. SHARPE, U.S. Environmental Protection Agency (EPA), the Department of Toxic Substances Control (DTSC), and the Central Valley Regional Water Quality Control Board (CVRWQCB) agreed that it would be best to manage these underground storage tanks (USTs) in accordance with the California UST regulations. Consequently, closure of these tank sites was deferred to the state program that manages closure of USTs. A total of 20 tanks have been closed to date. The remaining six tanks have only petroleum contamination and are in the process of being closed (see Table 2-1). These six tanks are identified in Table 2-1 with an "*" and will comply with State requirements. All work associated with USTs is conducted under the oversight of the CVRWQCB.

Additional work has been planned under SHARPE's Stormwater Pollution Prevention Program. A sump with sludge containing high levels of metals and VOCs will be closed. This sump is located in the eastern portion of the Central Area (see pink dot on Fig. 2-1). Closure will involve removal of the sludge and transportation to an appropriately permitted waste management facility, followed by capping stormwater connections to the sump. It has not yet been determined if the state will require that the sump be removed. Another project being conducted under SHARPE's Stormwater Pollution Prevention Plan involves the oxidation/evaporation pond (see orange shaded area of Fig. 2-1). Elevated concentrations of metals will be removed from this site. Closure of the sump and the oxidation/evaporation pond will comply will all federal, state, and local laws. All Stormwater Pollution Prevention Program work will be completed outside the scope of CERCLA. All work associated with stormwater will be conducted under the oversight of CVRWQCB National Pollutant Discharge Elimination System (NPDES) Program.

All studies and remedial actions were conducted under a Federal Facilities Agreement between the U.S. Department of Defense (DOD), EPA, and the State of California.

Table 2-1. USTs Closed or in Process of Being Closed

Tank Number	Description	Comments
60	Oil Water Separator Sump, Engine Test Facility	Tank removed October 1993 by EIA, Inc. Sampling results indicate no remediation necessary
70	Oil Water Separator; washrack	Tank removed October 1993 by EIA, Inc. Sampling results indicate no remediation necessary
79	Oil Water Separator; maintenance shop	Tank removed October 1993 by EIA, Inc. Sampling results indicate no remediation necessary
9	Railroad maintenance bldg (valve vault)	Valve and piping vault; concrete construction; clean based on test results by PetroTek; no remediation required; removed May 1990
11	Railroad maintenance bldg (waste oil tank)	Steel tank; removed 1990; sampling result ND for TPH-D and TPH-G; adjacent tank area remediated by Speiss Construction (COE contract); Confirmed Clean
26	Oil Water Separator; washrack	Investigation performed 1990 by Mark Group; contamination removed January 1990 by DieDe Construction
20	Contaminated fuel tank	Tank removed May 1990; no contamination found during removal sampling
27	Diesel/waste oil	Location of test pit; tank removed by PetroTek in March 1990; remediated/sampled by ESE in 1992; 3000 cubic yards of contaminated soil removed; extraction well NA-10 and MW 477A installed
35	Contaminated Fuel	Removed 1984 for construction of WDC; sampled 9 Nov 1992 by ESE; no contamination; see soils FS for details
36	Contaminated Fuel	Removed March 1986; remediated July 1986; certified clean closure to SJC in August 1986 by SHARPE Contractors (Kleinfelder Associates did closure)
37	Contaminated Fuel	Removed March 1996; remediated July 1986; certified clean closure to SJC in August 1986 by SHARPE Contractors (Kleinfelder Associates did closure)
10	Contaminated Fuel	Tank removed May 1990; tank remediation being performed 1993-94 under Corps of Engineers contract (CVRWQCB has reviewed design and specifications for this job)
71*	Contaminated Fuel	Tank removed October 1993 by EIA Inc.; results pending; EIA will remediate based on contaminant levels; reference table from Work Plan Addendum - July 1992
29	Waste solvent	Tank removed March 1990; samples showed no significant contamination (sampling by PetroTek); does not require remediation based on sample results; Board groundwater concern - this IS within capture zone of NB and CA systems
48	Waste oil	Tank removed March 1990; test pit location during November 1992; contaminated soils remediated; test pit backfilled after CVRWQCB approval on 7 January 1993; see PS5; MW 476A located downgradient

49*	Waste oil	Tank removed March 1990; installed MW 474 downgradient (PCB detected); remediation required based on sampling results; contract awarded Summer, 1994
50	Waste oil	Tank removed March 1990; sampling results indicate no remediation necessary
51	Waste oil	Tank removed March 1990; sampling results indicate no remediation necessary
52	Solvent waste	Tank removed March 1990; sampling results indicate no remediation necessary
53	Waste oil	Tank removed March 1990; sampling results indicate no remediation necessary
54	Kerosene	Tank removed March 1990; sampling results indicate no remediation necessary
55*	Waste Oil	Tank removed March 1990, installed MW 473 downgradient (PCB detected); remediation required based on sampling results; contract awarded Summer, 1994
5*	Diesel/Waste oil	Tank removed March 1990; remediation required based on sampling results; remediation completed. Closure pending board review.
59	Unknown	Tank removed May 1990; sampling results indicate no remediation necessary
*	Sump/ Grease trap	Inactive sump; liquids removed; located inside building; concrete construction; sampling to be performed underneath sump March 1994; sump will be properly closed
16*	Sump (north of 404)	Inactive sump; remediation to be performed IAW Soils FS; see PS 4 for RA sites.
46	Oil-Water Separator	Pit Separator removed; no contamination; MW 439A replaced MW469A which was destroyed

*indicates that site has not been closed, further work required.

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3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI/FS and Basewide Proposed Plan for SHARPE were released to the public on February 22, 1995. These two documents were made available to the public in the administrative record, located at SHARPE. The administrative file index (an index of all reports and correspondence located in the administrative file) is located at the Manteca Branch of the Stockton-San Joaquin County Public Library. The notice of availability for these two documents was published in The Stockton Record. A public comment period was held from February 22 to March 24, 1995. In addition, a public meeting was held on March 1, 1995. At this meeting, representatives from SHARPE, USAEC, DTSC, CVRWQCB, and EPA Region IX answered questions about the site and the remedial alternatives under consideration. The Responsiveness Summary, located at the end of this ROD, shows that no comments were received from the public during the public comment period.

This document presents the selected remedial action for OU2 at SHARPE, Lathrop, CA. This route of remedial action was chosen in accordance with CERCLA as amended by SARA to the extent practicable, the NCP, and Chapter 6.8 of the California Health and Safety Code. Further, these actions are being taken in response to the California Water Code. The decision for this site is based on the administrative record.

4.0 SCOPE AND ROLE OF RESPONSE ACTION

The scope of response actions for OU2 addresses contaminated soils at SHARPE. Although it was initially intended that OU2 would address additional groundwater contaminants at SHARPE, data collected since publication of the OU1 groundwater ROD indicate that, at this point in time, no additional groundwater remedial action is warranted. However, continued groundwater monitoring will be performed as part of the preferred alternatives described herein. It is expected that this Basewide ROD represents the second and last ROD prepared for the SHARPE site.

The scope of the response action pertaining to soils addresses the following conditions at the following locations (Fig. 2-1):

1. Soils containing lead and chromium that exceed cleanup standards in the following areas:
   - Eight areas in the North Balloon Area [see red-shaded areas, seven of which are located within/near the balloon-shaped area; the eighth is located below and to the left of the previously referenced area (directly under the blue-shaded region of the North Balloon Area)].
   - Six areas in the South Balloon Area (see gray-shaded regions with red dots on the left side of Fig. 2-1).

2. Soils containing TCE that may potentially be source areas for contaminated groundwater are in the following areas:
   - Five areas (see blue shaded areas of Fig. 2-1) that have been subject to pilot testing using ISV.
   - Two areas [see black shaded areas of Fig. 2-1 (one at upper-left of figure and one at the northern end of the runway)] where elevated concentrations of TCE have been reported.
   - Seven areas (see green shaded areas of Fig. 2-1) have been identified as requiring additional soil gas characterization, and contingent upon the data provided, these areas may also be included within the response action.

3. During the course of the CERCLA investigations, SHARPE recommended that many sites be considered NFA sites. A no action determination is appropriate in the following situations: when

an area is already in a protective state (i.e., an area poses no current or potential threats to human health or the environment); or when CERCLA does not provide the appropriate legal authority to undertake a remedial action. The 1994 Soils FS documented all sites that SHARPE considers to require NFA along with the rationale supporting why NFA would be required. EPA, DTSC, and CVRWQCB have reviewed this information and agree that a total of 111 SWMUs fall into the category of NFA. Additional information pertaining to the NFA sites is presented in Sec. 9.3.

5.0 SUMMARY OF SITE CHARACTERISTICS

The data collected for the RI was comprehensive with respect to a variety of samples analyzed for a variety of target analytes. The Risk Assessment (RA) evaluated all data and defined COCs, as discussed in the Sec. 6.0 of this ROD. With the exception of the pesticides chlordane and DDT, evaluation of COCs indicated that only lead and chromium represent potential health threats to the onsite adult worker (the relevant exposure population).

Elevated levels of chlordane and DDT were reported in the Pesticide Management Area. A Removal Action Memorandum was finalized for this area in October 1994. Soil removal was completed in March 1995. All soils determined to represent a potential threat as defined in the Removal Action Memorandum were removed.

TCE, another site soil contaminant, was determined to not represent a potential threat to human health or the environment based on the relevant exposure scenarios evaluated in the RA. However, TCE-contaminated soils represent a continuing threat to groundwater quality through leaching pathways. Therefore, the Soils FS evaluated alternatives to remediate TCE-contaminated soils for the purpose of minimizing the transport of TCE to groundwater.

Given the above information, the following discussion regarding site characteristics is predominantly focused on lead, chromium, and TCE, as these contaminants represent the chemicals that will need to be remediated as part of the response actions for OU2. Additional information regarding site contaminants is presented in Sec. 6.0.

5.1 TCE CONTAMINATION

The disposal of VOCs occurred in designated disposal areas such as the South Balloon Area and North Balloon Area. Disposal also occurred at undesignated, isolated spots in the Central Area of the depot. Accidental releases of VOCs occurred at UST locations and in areas where vehicles and equipment were defueled.

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Seven VOC plumes exist in the groundwater within the three shallowest aquifers beneath SHARPE and offsite, downgradient from the site (Fig. 5-1). The approach to data presentation in the RI and the groundwater FS was to report suspected contamination with respect to each of the contaminant groundwater plumes. To maintain consistency, areas of suspected soil contamination are presented below by plume. The results of record searches, soil gas measurements, and soil analyses are grouped by recognized VOC groundwater plumes (Fig. 5-1). Four different areas of VOC-contaminated soil (predominantly TCE) exist at the site:

1. Plume 1 (South Balloon Area Plume)--An estimated total of 33,200 cubic yards (yd3) of TCE-contaminated soil was found. Results of the 1987 soil gas survey are summarized in Fig. 5-2.

2. Plumes 4 and 5--An estimated total of 11,400 yd3 of TCE-contaminated soil was found. Results

of the 1987 soil gas survey are summarized in Fig. 5-3.

3. Plume 6--An estimated total of 14,700 yd3 of TCE-contaminated soil was found. Results of the 1987 soil gas survey are summarized in Fig. 5-4.

4. Plumes 7 and 8 (North Balloon Area Plume)--An estimated total of 14,000 yd3 of TCE-contaminated soils was found. Results of the 1987 soil gas survey are summarized in Fig. 5-5.

Additional areas were also investigated to determine if they are sources of VOCs:

5. Plume 2--Results of the 1987 soil gas survey are summarized in Fig. 5-6. Confirmatory soil samples showed no soil contamination in this area.

6. Plume 3--Results of the 1997 are summarized in Fig. 5-7. Confirmatory soil samples showed only one detection of TCE in soils, at a concentration of 0.010 mg/kg.

Fig. 2-1 shows the areas onsite that are suspected of being source areas of TCE contamination (designated as blue and black shaded areas). Additional areas (depicted in green) show where further characterization via soil gas will be completed to determine if additional source areas exist onsite.

5.2 LEAD- AND CHROMIUM-CONTAMINATED SOILS

Lead and chromium have been detected in concentrations greater than the cleanup standards of 1,000 mg/kg and 300 mg/kg, respectively. A detailed discussion regarding cleanup standards is presented in Sec. 7.1. The following SWMUs are sources of this contamination:

1. S#3-Bldg. S-119;
2. S#26-Open dumping from Bldg. 170 to 184;
3. S#28-South Balloon Area (Metal Stripping Sludge Worked Through Soil);
   and
4. S#29--South Balloon Area (burn pits).

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Following presentation of total lead and chromium data for the aforementioned sites, a discussion of leachable lead and chromium is presented.

5.2.1 S#3--BLDG. S-119 (SPRAY PAINT BOOTH)

The presence of lead and chromium was confirmed at this SWMU during the RI phase of work. Additional field testing was performed in 1991 to delineate the extent of lead contamination at Bldg. S-119 (Fig. 5-8). The results of the study indicated the highest levels of lead contamination were found in the surface soil samples collected south, southwest, and immediately west of Bldg. S-119. The highest lead concentration reported was 5,115 milligrams per kilogram (mg/kg). None of the split-spoon samples collected at depths between 0.5 and 4.0 feet below land surface (ft-bls) in areas with high surface soil contamination contained any measurable concentrations of lead. Also, two samples collected at one location indicated that the

contamination (4,493 mg/kg) lies in the several inches of soil covering the asphalt. Lead contamination is restricted to the surface soils across the site, even where no asphalt pavement is present. Chromium was not analyzed for in this study.

Fig. 5-9 is an isoconcentration map of lead in the surface soil at the study site. The figure shows that the surface soil lead contamination has been found in all directions radiating from Bldg. S-119, except possibly to the south. Sampling in this direction was discontinued when Bldg. S-115 was reached.

The surface area of contaminated soil inside the 1,000-mg/kg contour line was calculated by measurement with a planimeter. The resultant area is depicted in Fig. 5-9. The area in which levels of lead are greater than 1,000-mg/kg covers 8,775 ft^2, which represents 4,398 ft3 (163 yd3) of contaminated soil, assuming depth of contamination is 6 inches.

No samples were collected for the evaluation of leachable metals.

5.2.2 S#26--OPEN DUMPING FROM BLDGS. 170 TO 184

Open dumping of waste received from Bldgs. 170 to 184 (Fig. 5-8) occurred in the North Balloon Area. No coordinates have been specified for the dumping area. Work conducted during the RI confirmed the frequency and elevated concentrations of lead and chromium in soils.

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<IMG SRC 0996145M>

In November 1992, an additional field effort was conducted to evaluate the extent of lead and chromium contamination at SWMU No. 26 (S#26) in the North Balloon Area. S#26 is the portion of the North Balloon Area characterized by past open dumping of sandblasting waste received from Bldgs. 170 and 184 (Fig 5-10). The predominant waste dumped in the North Balloon Area was probably sandblasting sand, which is expected to contain paint chips and solvent residues.

The primary objectives of the investigation were to identify each of the dumping sites where the sandblasting waste was disposed of, define the horizontal and vertical extent of previously identified lead and chromium contamination at each dumping site, and determine if the groundwater downgradient of the North Balloon Area was contaminated with lead and chromium related to the sandblasting waste.

Lead in Soil
Soil contaminated with lead in excess of 1,000 mg/kg (measured by XRF), presented in Fig. 5-10, was estimated to be approximately 27,650 ft^2. Assuming a maximum contamination depth of 6 inches, the total volume of lead-contaminated soil is estimated at 13,825 ft3 (512 yd3).

Laboratory and XRF data for lead were plotted to evaluate correlation between the two methods. Although the XRF data overestimated actual conditions, it was not adjusted. Therefore, estimates of lead-contaminated soils are likely to be high. Estimates derived are considered to be adequate for FS purposes. However, it would be appropriate to confirm the extent of lead contamination during the remedial design phase of work. Other parts of the North Balloon Area that should be evaluated include nodes F1.5, M4, and O-13, where laboratory values of lead approached or exceeded the cleanup standards of 1,000 mg/kg.

None of six soil samples from three collected borings (from 3 and 5 ft-bls) contained lead in excess of 200 mg/kg. The observed values ranged from 2 to 196 mg/kg.

Chromium in Soil

Localized concentrations of 300 mg/kg chromium or higher as measured by XRF were observed at three locations (Fig. 5-11). The area inside the 300-mg/kg contour line was estimated at approximately 12,375 ft^2. Assuming a depth of contamination of 6 inches, the total volume of chromium-contaminated soil is approximately 6,188 ft^2 (239 yd3).

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<IMG SRC 0996145O>

XRF and laboratory data for chromium were plotted to evaluate correlation between the two methods. Although the XRF data overestimated actual conditions, it was not adjusted. Therefore, estimates of chromium-contaminated soils are likely to be high, Estimates derived are considered to be adequate for FS purposes. However, it would be appropriate to confirm the extent of chromium contamination during the remedial design phase of work. Grid node O-16 should also be evaluated during this phase, as the laboratory value for chromium slightly exceeded the chromium cleanup standard of 300 mg/kg.

Comparison of Figs. 5-10 and 5-11 indicates that soils with chromium concentrations in excess of cleanup standards generally coincide with soils with lead concentrations in excess of cleanup standards.

None of six soil samples from three collected borings (from 3 and 5 ft-bls) contained chromium in excess of 300 mg/kg. The observed values ranged from 13 to 47 mg/kg.

Hexavalent chromium was found in all three samples analyzed for this compound. The concentrations ranged from 0.11 to 0.57 mg/kg.

Lead and Chromium in Groundwater

Total and filtered groundwater samples were collected from wells near S#26 in November 1992. Additional samples of filtered groundwater were analyzed in 1994 from four sampling episodes. The results of the 1992 and 1994 sampling efforts are summarized in Table 5-1.

The limited data that is currently available shows that groundwater has not been degraded by lead and chromium at levels greater than the drinking water standard of 15 µg/L and 50 µg/L, respectively.

5.2.3 S#28-SOUTH BALLOON AREA METAL STRIPPING SLUDGE WORKED THROUGH SOIL)

Waste from paint stripping operations at SHARPE historically has been disposed of in the IWTP and the South Balloon Area. Waste (sludges) was routinely trucked to the IWTP, where liquids were discharged into the oxidation ponds for treatment and solids were spread on the ground in the South Balloon Area. The solids were then turned into the ground during tests of refurbished heavy equipment in an early attempt at bioremediation. Tests called for 4 hours of continuous operation; therefore, it is presumed that the sludge was thoroughly mixed with the soil.

TABLE 5-1. LEAD AND CHROMIUM IN NORTH BALLOON AREA GROUNDWATER

	413A	420A	438A
LEAD CONCENTRATIONS			
Nov 92 - Unfiltered	<0.002	0.012	0.003
Nov 92 - Filtered	<0.002	<0.002	<0.002
Feb 94	<0.005	<0.005	<0.006
Apr-May 94	<0.005	<0.005	<0.005
Aug 94	0.016	<0.005	<0.005
Oct 94	<0.005	<0.005	<0.005
CHROMIUM CONCENTRATIONS			
Nov 92 - Unfiltered	0.044 (0.033)	0.030 (0.008)	<0.006 (<0.003)
Nov 92 - Filtered	0.042 (0.031)	0.018 (0.011)	<0.006 (<0.003)
Feb 94	0.013	0.040	<0.006
Apr - May 94		0.038	<0.005
Aug 94	0.011	0.011	<0.005
Oct 94	0.011	0.032	<0.005

All concentrations in milligrams per liter.
Values in ( ) represent concentration of Cr6+

Source: ESE.

Sampling conducted during the RI phase of work indicated the presence of elevated lead and chromium concentrations in soil.

Additional soil sampling in the South Balloon Area was conducted during April 1994 to delineate and characterize potential lead and chromium contamination. In 1984, Technos, Inc. used various geophysical methods to map the location of eight burial trenches and pits in the South Balloon Area. This study indicated that the trenches and pits may contain buried metals. The purpose of soil sampling was to determine whether these burial trenches and pits are a source of metals contamination.

Two types of soil samples were collected; shallow soil samples (0-2 ft) and soil borings (0-15 ft).

Sample Locations
To ensure that the samples were properly located in the field and collected at known locations, a grid was set up across the South Balloon Area. The grid was surveyed in by a licensed surveyor and was based on the state plane coordinate system. It was set up with a 100-ft spacing and oriented north-south and east-west. The grid was labeled alphabetically from west to east and numerically from north to south (Fig. 5-12). Samples were located on the grid and named for the grid location (i.e., 50 ft east of 1A).

Shallow Soil Samples
Initially, 41 shallow soil samples were collected at predetermined locations. Based on the results from these initial samples, 9 additional shallow soil samples were collected from locations determined by the CVRWQCB, and two 15-ft profile borings were completed near two shallow sampling locations. Fig. 5-12 shows the location of the 50 shallow soil samples and the two profile borings.

Soil Borings
Twenty-nine initial borings in predetermined locations in the South Balloon Area were sampled, and 10 borings were sampled in three burn pit areas just west of the South Balloon Area. Based on the results of these samples, 10 additional borings and 2 vertical profile borings were completed at locations determined by the CVRWQCB in the South Balloon and burn pit areas. Fig. 5-12 shows the location of these 49 borings and the two vertical profile borings.

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Chromium
Samples were collected in accordance with the Work Plan Addendum (ESE, 1994c). Laboratory and XRF data for chromium were plotted to evaluate correlation between the two methods. This effort showed there was poor correlation between the field and laboratory methods for determining chromium concentrations in soil. Consequently, adjustments to the data were necessary to make the XRF data more representative of the confirmation samples. The adjusted data are adequate to conclude that some soils at depths of 0-2 ft do exceed the cleanup standard for chromium.

Adjusted data representing samples collected from 0-2 ft, 0-5 ft, 5-10 ft, and 10-15 ft are presented in Figs. 5-13, 5-14, 5-15, and 5-16, respectively.

Evaluation of data presented in the referenced figures indicates only three locations where chromium exceeds the 300 mg/kg cleanup level:

1. 50E-1H (368 mg/kg, 3-4 ft);
2. 50E-1F (722 mg/kg, 14-14.5 ft); and
3. S29B4 (329 mg/kg, 12.5-13.5 ft).

The quality of the adjusted data is not considered adequate to determine the volume of contaminated soils requiring remediation with a high level of certainty. It would be appropriate to reevaluate the extent of chromium contamination in the South Balloon Area during the remedial design phase of work at locations where chromium has been reported or is suspected of exceeding the cleanup standard (based on the XRF data, e.g., grid point 9G).

Considering the previous information and that shallow soil samples (0-2 ft, the interval considered appropriate for remediation when considering protection of human health and environment) were not collected in areas where chromium was reported greater than 300 mg/kg, two assumptions were necessary to estimate the volume of chromium-contaminated soils exceeding cleanup standards:

1. All points where chromium concentrations were reported to exceed the cleanup standard will be assumed to require remediation in the 0- to 2-ft range; and

2. The extent of contamination will be based on the average area of contamination reported for the North Balloon Area effort. This is a reasonable assumption, since the method of waste disposal in the South Balloon Area shallow soils (soil spreading) was similar to the North Balloon Area.

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<IMG SRC 0996145R>
<IMG SRC 0996145S>
<IMG SRC 0996145T>

As shown in Fig. 5-11, three locations exceed the cleanup standard for chromium in the North Balloon Area. The total area represented by these locations is 12,375 ft^2; the average area represented per site is 4,125 ft^2. Assuming that this area is representative of areas in the South Balloon Area where chromium has exceeded 300 mg/kg, the total area requiring remediation in the South Balloon Area is estimated as 12,375 ft^2 (a total of three sites). Assuming excavation to a depth of 2 ft, the total volume of soils to be remediated is approximately 916 yd3.

Table 5-2 also reports leachable chromium concentrations from specific samples, This data indicates there is a potential threat to groundwater from leachable chromium.

More detailed information on this subject can be found in the FS.

Table 5-2. Trench and Burn Pit Boring Soil Samples Collected in the South Balloon Area

Sample Grid Location	Sample Depth (ft-bgs)	Corrected XRF Analytical Values Cr (ppm)	Corrected XRF Analytical Values Pb (ppm)	Laboratory Analytical Values DI-WET Cr (ug/L)	Laboratory Analytical Values DI-WET Pb (ug/L)	Laboratory Analytical Values Total Cr (mg/kg)	Laboratory Analytical Values Total Pb (mg/kg)	Laboratory Analytical Values Cr+6** (mg/kg)	Laboratory Sample ID Number
Trench 15 ft Borings:									
9E	2-3*	171	6691	13	39.9	91.8	27500	--	16
	5-6*	119	1027	BDL	9.6	72.6	17700	--	17
	12-13	5	369	10	8.2	14.6	4.36	--	15
10N-8H	4-5	0	147	--	--	--	--	--	--
	6-7	3	22	-	-	-	-	-	-
	11-12	3	200	-	--	--	--	--	--
D7	2-3	0	130	--	--	--	--	--	--
	6-7	2	97	--	--	--	--	--	--
	13.5-14.5	0	266	--	--	--	--	--	--
5B	2-3	0	114	--	--	--	--	--	--
	9-10	2	203	--	--	--	--	--	--
	10-11	0	181	--	--	--	--	--	--
41S&30E-4	1-2	0	73	--	--	--	--	--	--
	7.5-8.5	0	82	--	--	--	--	--	--
	12-13	26	84	10	2	--	--	--	30
50S&50E-4	1-2	0	404	--	--	--	--	--	--
	7-8	0	95	--	--	--	--	--	--
	13-14	0	209	--	--	--	--	--	--
50S&50E-2	2-3	0	109	--	--	--	--	--	--
	7.5-8.5	11	232	--	--	--	--	--	--
	14-15	71	183	BDL	BDL	--	--	--	29
3C	2-3	5	221	--	--	--	--	--	--
	7-8	9	269	--	--	--	--	--	--
	13.5-14.5	2	421	--	--	--	--	--	–

50S&50ZE-1	3-4	4	326	--	--	--	--	--	--
	8-9	12	335	--	--	--	--	--	--
	12-13	20	375	BDL	2.4	--	--	--	33
5I	2-3	0	71	--	--	--	--	--	--
	6-7	0	13	--	--	--	--	--	--
	12-13	0	290	--	--	--	--	--	--
3J	3-4	0	206	--	--	--	--	--	--
	8-9	0	222	--	--	--	--	--	--
	12.5-13.5	0	290	--	--	--	--	--	--
25N&25W-4	2-3	2	119	--	--	--	--	--	--
	8.5-9.5	0	19	--	--	--	--	--	--
	13-14	10	105	BDL	4.4	--	--	--	34
50S-2H	4-5	0	157	--	--	--	--	--	--
	9-10	58	575	BDL	15.8	--	--	--	35
	14-15	0	313	--	--	--	--	--	--
50S&50E-3	2-3	3	406	--	--	--	--	--	--
	7-8	131	0	23	4.1	68.7	688	--	22
	11.5-12.5	0	134	--	--	--	--	--	--
50E-2F	2-3	6	206	--	--	--	--	--	--
	8-9	5	136	--	--	--	--	--	--
	12.5-13.5	3	104	--	--	--	--	--	--

Table 5-2. Trench and Burn Pit Boring Soil Samples Collected in the South Balloon Area (Continued, Page 2 of 4)

Sample Grid Location	Sample Depth (ft-bgs)	Corrected XRF Analytical Values Cr (ppm)	Corrected XRF Analytical Values Pb (ppm)	Laboratory Analytical Values DI-WET Cr ug/L)	DI-WET Pb (ug/L)	Total Cr (mg/kg)	Total Pb (mg/kg)	Cr+6** (mg/kg)	Laboratory Sample ID Number
50E-1H	3-4	368	1481	37	24.6	233	3990	--	21
	6.5-7.5	0	35	--	--	--	--	--	--
	12-13	0	58	--	--	--	--	--	--
50E-1G	3-4	99	960	27	15.7	65.3	1160	--	23
	6-7	57	714	14	3.5	65.9	1140	--	24
	13-14	5	126	10	2.1	12.3	2.33	--	25
50E-1F	2-3	14	130	--	--	--	--	--	--
	6-7	5	39	--	--	--	--	--	--
	14-14.5	722	0	16	3.6	15.2	41.9	--	19
]50N&50E-1	2-3	119	452	--	--	--	--	--	--
	6.5-7.5	22	242	--	--	--	--	--	--
	13-13.5	42	136	BDL	BDL	--	--	--	31
7S-1F	3-4	8	209	--	--	--	--	--	--
	7-8	22	31	--	--	--	--	--	--
	13-14	3	187	--	--	--	--	--	--
50N-1E	3-4	0	45	--	--	--	--	--	--
	5.5-6.5	0	65	--	--	--	--	--	--
	12-13	5	16	--	--	--	--	--	--
50E-2E	3-4	4	274	--	--	--	--	--	--
	8-9	0	86	--	--	--	--	--	--
	12.5-13.5	4	5	--	--	--	--	--	--
50W-2E	3-4	0	0	--	--	--	--	--	--
	6.5-7.5	0	0	--	--	--	--	--	--
	12-13	0	100	--	--	--	--	--	–

50E-3D	3-4	0	0	--	--	--	--	--	--
	6.8-7.8	3	0	--	--	--	--	--	--
	13-14	11	0	--	--	--	--	--	--
50S-3D	4-5	0	0	--	--	--	--	--	--
	7-8	0	0	--	--	--	--	--	--
	12-13	0	0	--	--	--	--	--	--
50S-4D	4-5	0	21	--	--	--	--	--	--
	7.4-8.4	3	0	--	--	--	--	--	--
	14-14.5	4	75	--	--	--	--	--	--
50S&50E-4	3-4	0	5	--	--	--	--	--	--
	7.3-8.3	0	0	--	--	--	--	--	--
	14-15	12	1	--	--	--	--	--	--
50S&50E-5	3-4	0	43	--	--	--	--	--	--
	6-7	10	42	--	--	--	--	--	--
	12.8-13.8	24	142	BDL	5.8	--	--	--	36
50S&5-E-5	3-4	0	52	--	--	--	--	--	--
	6.4-7.4	0	36	--	--	--	--	--	--
	12.5-13.5	0	219	--	--	--	--	--	--
Total Sample		87	87	16	16	9	9	0	--
Burn Pit 18 ft Borings:									
S30-B1	4-5	0	0	--	--	--	--	--	--
	7-8	4	3	--	--	--	--	--	--
	13-14	3	14	--	--	--	--	--	--
S30-B2	3-4	10	6	--	--	--	--	--	--
	6-7	8	44	--	--	--	--	--	--
	11.6-12.6	14	4	BDL	BDL	--	--	--	37
S30-B3	3-4	2	5	--	--	--	--	--	--

Table 5-2. Trench and Burn Pit Boring Soil Samples Collected in the South Balloon Area (Continued, Page 3 of 4)

Sample Grid Location	Sample Depth (ft-bgs)	Corrected XRF Analytical Values Cr (ppm)	Corrected XRF Analytical Values Pb (ppm)	Laboratory Analytical Values DI-WET Cr (ug/L)	DI-WET Pb (ug/L)	Total Cr (mg/kg)	Total Pb (mg/kg)	Cr+6** (mg/kg)	Laboratory Sample ID Number
	6.5-7.5	0	3	--	--	--	--	--	--
	12-13	5	5	--	--	--	--	--	--
S30-B4	2-3	4	0	--	--	--	--	--	--
	6-7	0	0	--	--	--	--	--	--
	13.5-14.5	4	0	--	--	--	--	--	--
S29-B4	1.5-2.5	43	192	--	--	--	--	--	--
	8-9	158	1421	--	--	--	--	--	--
	12.5-13.5	329	0	--	--	--	--	--	--
S29-B5	3-4	8	0	--	--	--	--	--	--
	6.5-7.5	0	0	--	--	--	--	--	--
	11-12	8	5	--	--	--	--	--	--
S29-B6	2-3	44	60	--	--	--	--	--	--
	5-6	2	0	--	--	--	--	--	--
	13.5-14.5	58	0	BDL	8.5	3.8	0.807	--	20
S29-B7	2-3	6	0	--	--	--	--	--	--
	5-6	0	0	--	--	--	--	--	--
	10-11	0	0	--	--	--	--	--	--
S18-B2	3-4	10	0	--	--	--	--	--	--
	7.5-8.5	3	34	--	--	--	--	--	--
	12.5-13.5	16	22	10	5.1	--	--	--	38
S18-B3	3-4	21	0	--	--	--	--	--	--
	8-9	13	52	--	--	--	--	--	--
	10-11	54	27	BDL	BDL	--	--	--	32
Total Sample		30	30	4	4	1	1	0	--

Optional Trench and Burn Pit Borings:									
S18-B4	3.5-4.5	0	339	--	--	--	--	--	--
	7.5-8.5	4	197	--	--	--	--	--	--
	13-14	20	151	--	--	--	--	--	--
S29-B8	3.5-4.5	17	177	--	--	--	--	--	--
	7-8	6	236	--	--	--	--	--	--
	12.5-13.5	7	331	--	--	--	--	--	--
S29-B9	2-2.5	110	1542	12.8	25.3	--	--	BDL	11
S29-B10	2-3	0	357	--	--	--	--	--	--
S29-B11	2.5-3	41	412	--	--	--	--	--	--
50S-9E	3-4	6	279	--	--	--	--	--	--
	6-7	25	268	--	--	--	--	--	--
	10-11	23	347	BDL	4.7	--	--	0.103	13
50E-9E	3-4	0	68	--	--	--	--	--	--
	8.2-9.2	14	192	--	--	--	--	--	--
	12-12.5	0	278	--	--	--	--	--	--
50E&75N-1	3-4	3	242	--	--	--	--	--	--
	5.5-6.5	0	86	--	--	--	--	--	--
	10.5-11.5	2	69	--	--	--	--	--	--
50S-1I	2-3	25	156	--	--	--	--	--	--
	8-9	4	108	--	--	--	--	--	--
	12.5-13.5	5	175	BDL	10.3	--	--	BDL	14
2H	3.5-4.5	0	34	--	--	--	--	--	--
	9-10	0	158	--	--	--	--	--	--
	13-14	33	610	--	--	--	--	--	--
Total Samples		24	24	3	3	0	0	3	--

Table 5-2. Trench and Burn Pit Boring Soil Samples Collected in the South Balloon Area
(Continued, Page 4 of 4)

Sample Grid Location	Sample Depth (ft-bgs)	Corrected XRF Analytical Values Cr (ppm)	Corrected XRF Analytical Values Pb (ppm)	Laboratory Analytical Values DI-WET Cr (ug/L)	Laboratory Analytical Values DI-WET Pb (ug/L)	Laboratory Analytical Values Total Cr (mg/kg)	Laboratory Analytical Values Total Pb (mg/kg)	Laboratory Analytical Values Cr+6** (mg/kg)	Laboratory Sample ID Number
Vertical Profile 15 ft Borings:									
S29-B12	0-1	35	394	18	5.6	--	--	--	39
	2-3	132	808	20	4.4	--	--	--	40
	8.5-9.5	158	1364	31.1	31	--	--	0.025	12
	12.5-13.5	11	206	BDL	3.1	--	--	--	41
48E-1F	0-1	3	252	21	4.9	--	--	--	42
	3-4	233	474	11.7	11.1	--	--	0.196	15
	8-9	0	0	BDL	2.4	--	--	--	43
	12-13	7	0	BDL	BDL	--	--	--	44
Total Sample		8	8	8	8	0	0	2	--
Grand Total Samples:		149	149	31	31	10	10	5	

*Samples split with California Central Valley Regional Water Quality Control Board (probably not complete listing)

**Total Title 22 metals analysis were also done on the samples analyzed for hexachromium.

Note: -- = not applicable or sample not analyzed
BDL = below detection limit

Table 5-3. Surficial Soil Samples Collected in the South Balloon Area

Sample Grid Location	Sample Depth (ft-bgs)	Field XRF Analytical Values Cr (ppm)	Field XRF Analytical Values Pb (ppm)	Laboratory Analytical Values DI-WET Cr (ug/L)	Laboratory Analytical Values DI-WET Pb (ug/L)	Laboratory Analytical Values Total Cr (mg/kg)	Laboratory Analytical Values Total Pb (mg/kg)	Laboratory Sample ID Number
Initial Surface Soil Samples:								
8B	0-2	4	177	--	--	25.4	64.3	6
8E	0-2	1	35	--	--	--	--	--
9G	0-2*	89	938	44.8**	50.3**	--	--	1
35S-41	0-2*	14	0	--	--	--	--	--
31E-1E	0-2*	8	0	--	--	--	--	--
42W-2C	0-2*	0	0	--	--	--	--	--
42S-2B	0-2	20	205	--	--	--	--	--
38S&36E-1	0-2	1	381	--	--	73.7	365	7
2B	0-2	3	83	--	--	--	--	--
4B	0-2	0	12	--	--	--	--	--
5B	0-2	1	145	--	--	--	--	--
6C	0-2	18	227	147	241	--	4	
4C	0-2	9	6	--	--	--	--	--
3E	0-2	0	48	--	--	--	--	--
3D	0-2	0	5	--	--	--	--	--
5D	0-2	0	0	--	--	--	--	--
6D	0-2	1	0	--	--	--	--	--
46S&52W-5	0-2	8	27	--	--	--	--	--
52N-6E	0-2	1	39	--	--	--	--	--
32N-5E	0-2	0	9	--	--	--	--	--
4F	0-2	7	55	--	--	--	--	--
25S&21W-4	0-2	2	0	--	--	--	--	--
5G	0-2	5	62	--	--	--	--	--
3F	0-2	9	22	--	--	--	--	--
20S-3G	0-2	41	166	22	52.4	--	--	3
2F	0-2	0	58	--	--	--	--	--
2E	0-2	0	0	--	--	--	--	--
37S-2H	0-2	27	0	--	--	18.9	55.8	8
1H	0-2	8	64	--	--	--	--	--

56N-1H	0-2	0	0	--	--	--	--	--
1G	0-2	9	66	--	--	--	--	--
52S-2I	0-2	0	0	--	--	--	--	--
49N-2I	0-2	3	79	--	--	30.5	102	9
2G	0-2	12	3	--	--	--	--	--
21E&24N-1	0-2	3	0	14.6	27.2	--	--	5
21E-1F	0-2	26	0	227	1230	--	--	2
12W-1F	0-2	0	0	--	--	--	--	--
99N-1E	0-2	2	8	--	--	--	--	--
50E-7H	0-2	4	0	--	--	--	--	--
50N-6I	0-2	0	17	--	--	8.69	12.4	10
9I	0-2	5	0	--	--	--	--	--
Total Samples		41	41	5	5	5	5	--
Optional Surficial Soil Samples:								
7J	0-2	0	252	--	--	--	--	--
7N-9G	0-2	0	0	--	--	--	--	--
10E-9G	0-2	2	177	--	--	--	--	--
10W-9G	0-2	13	268	--	--	--	--	--
10S-9G	0-2	2	60	--	--	--	--	--
20S&10E-3	0-2	4	204	--	--	--	--	--
20S-3G	0-2	0	94	--	--	--	--	--
10S-3G	0-2	10	299	--	--	--	--	--
20S&10W-3	0-2	0	17	--	--	--	--	--
Total Samples		9	9	0	0	0	0	--
Vertical Profile 16 ft Borings:								
42S-2B	0-0.5	18	374	--	--	--	--	--
	2-3	2	218	--	--	--	--	--

Table 5-3. Surficial Soil Samples Collected in the South Balloon Area
(Continued, Page 2 of 2)

Sample Grid Location	Sample Depth (ft-bgs)	Field XRF Analytical Values Cr (ppm)	Field XRF Analytical Values Pb (ppm)	Laboratory Analytical Values DI-WET Cr (ug/L)	Laboratory Analytical Values DI-WET Pb (ug/L)	Laboratory Analytical Values Total Cr (mg/kg)	Laboratory Analytical Values Total Pb (mg/kg)	Laboratory Sample ID Number
	8-9	7	225	--	--	--	--	--
	11-12	7	277	--	--	--	--	--
9G	0-1*	37	504	--	--	--	--	--
	2-3*	27	426	--	--	--	--	--
	9-10*	0	169	--	--	--	--	--
	11-12	4	91	--	--	--	--	--
Total Samples		8	8	0	0	0	0	--
Grand Total Samples:		58	58	5	5	5	5	--

*Samples split with California Central Valley Regional Water Quality Control Board (total 8).

**DI-WET Title 22 metals analysis was done on sample from 9G.

Note: -- = not applicable or sample not analyzed.

Lead

Lead data were managed like the chromium data. Laboratory and XRF data for lead were plotted to evaluate correlation between the two methods. This effort showed there was poor correlation between the field and laboratory methods for determining lead concentrations in soil. Consequently, adjustments to the data were necessary to make the XRF data more representative of the confirmation samples. The adjusted data are adequate to conclude that some soils at depths of 0-2 ft do exceed the cleanup standard for lead. Adjusted data representing samples collected from 0-2 ft, 0-5 ft, 5-10 ft, and 10-15 ft are presented in Figs. 5-17, 5-18, 5-19, and 5-20, respectively. Evaluation of the data in Tables 5-2 and 5-3 and the referenced figures indicates that lead exceeds the 1,000 mg/kg cleanup standard in eight locations:

1. 9E (2-3 ft; 6,691 mg/kg by XRF; 27,500 mg/kg by laboratory analysis);
2. 9E (5-6 ft; 1,027 mg/kg by XRF; 17,700 mg/kg by laboratory analysis);
3. 50E-1H (3-4 ft; 1,481 mg/kg by XRF; 3,990 mg/kg by laboratory analysis);
4. 50E-1G (3-4 ft; 1,160 mg/kg by laboratory analysis);
5. 50E-1G (6-7 ft; 1,140 mg/kg by laboratory analysis);
6. S29-B4 (8-9 ft; 1,421 mg/kg by XRF analysis);
7. S29-B9 (2-2.5 ft; 1,541 mg/kg by laboratory analysis); and
8. S29-B12 (8.5-9.5 ft; 1,364 mg/kg by XRF analysis).

<IMG SRC 0996145U>
<IMG SRC 0996145V>
<IMG SRC 0996145W>
<IMG SRC 0996145X>

The quality of the adjusted data is not adequate to determine the volume of contaminated soils requiring remediation with a high level of certainty. It would be appropriate to reevaluate the extent of lead contamination in the South Balloon Area during the remedial design phase at locations where lead has been reported to exceed the cleanup standard or is suspected of exceeding the cleanup standard (based on the XRF data, e.g., grid locations 9G, 20S-3G, 50S and 50E-2B, 50S-2H, 50N and 50E-1F, and location S29-B4).

Considering the previous information and that shallow soil samples (0-2 ft) were not collected in areas where lead was reported greater than 1,000 mg/kg, two assumptions were necessary to estimate the volume of lead contaminated soils exceeding cleanup standards:

1. All points where lead concentration were reported to exceed the cleanup standard will be assumed to require remediation in the 0 to 2 ft range; and

2. The extent of contamination will be based on the average area of contamination reported for the North Balloon Area effort. This is reasonable since the method of waste disposal in the South Balloon Area shallow soils (soil spreading) was similar to the North Balloon Area.

As shown on Fig. 5-10, seven locations exceed the cleanup standard for lead. The total area represented by these locations is 27,650 ft^2; the average area represented per site is 3,950 ft^2. Assuming that this area is representative of areas where lead exceeds 1,000 mg/kg, the total area requiring remediation in the South Balloon Area is estimated at 19,750 ft^2 (a total of five sites). Assuming excavation to a depth of 2 ft, the total volume of soils to be remediated is approximately 1,460 yd3. Table 5-2 also reports leachable lead concentrations from specific samples. This data indicate there is a potential threat to groundwater from leachable lead. More detailed information on this subject can be found in the FS.

Lead and Chromium

Based on the previous information, and considering that the cleanup standards for lead and chromium have been exceeded at this site, remediation is warranted at this SWMU. The previous

sections estimate the total volume of soil with lead above cleanup standards as 1,460 yd3; the total volume of soil with chromium above cleanup standards is estimated as 916 yd3. The combined volume of soils requiring remediation in the South Balloon Area is estimated as 2,090 yd3. Because there are two locations where both lead and chromium are reported to exceed cleanup standards, the total volume of soils requiring remediation is not the sum of lead- and chromium-contaminated soil volumes. The areas to be remediated for lead- and chromium-contaminated soils are presented in Fig. 5-21.

The previous sections use several assumptions to estimate the volume of contaminated soils. The volume estimates were developed for FS purposes only. However, even if the actual volume of soil requiring remediation varies greatly from the above estimate, the analysis that was presented in the FS is adequate for remedy selection.

See App. G-2 of the Soils FS for further information pertaining to this SWMU.

5.2.4 S#29--SOUTH BALLOON (BURN PITS)

Much of the waste generated at the site including wood, paper, empty paint and solvent cans, waste paint, waste solvents, waste oil, used hydraulic fluid, and "anything else that would burn", was disposed of in burn pits in the South Balloon Area. Contaminated fuel reportedly was not disposed of in the pits. Among other constituents, lead and chromium were detected in the burn pit soils. Further characterization of this site was completed in 1994. The data and figures presented under the discussion of S#28 can be referenced for data pertaining to the burn pits.

5.2.5 LEACHABLE LEAD AND CHROMIUM AT S#26 AND S#28

As part of the total lead and chromium delineation activities for S#26 and S#28, samples were also collected to evaluate leachable lead and chromium from site soils. Leachability was evaluated using the California De-Ionized (DI) Water Waste Extraction Test (WET).

At the request of CVRWQCB, SHARPE completed a water quality assessment for lead and chromium. The water quality assessment uses results from DI-WET testing. Results of the water quality assessment for lead and chromium are presented in Tables 5-4 and 5-5, respectively. Data noted by Area NBA represents samples collected from SWMU S#26. Data noted by Area SBA represents samples collected from S#28.

<IMG SRC 0996145Y>

Table 5-4. Water Quality Assessment for Lead

Location	Area	Total µg/g	DI-WET µg/L	Leachable Concentration	Beneficial Use	Required Protection
M4-SHPBS2	NBA	1000	NA	NA	15	NA
B1-SHPBS2*	NBA	4710	139000	NA	15	NA
SL-04-C	NBA	NA	2	20	15	1
SL-04-B	NBA	NA	2	20	15	1
SL-02-C	NBA	NA	2	20	15	1
SL-01-A	NBA	NA	2	20	15	1
SL-03-B	NBA	NA	2.3	23	15	2
SS 1 to 6	NBA	NA	3.2	32	15	2
SL-03-C	NBA	NA	3.3	33	15	2
SL-01-B	NBA	NA	3.4	34	15	2
SL-03-A	NBA	NA	3.4	34	15	2
R3.5-SHPBS2	NBA	2130	3.6	36	15	2
S21-SHPBS2	NBA	5750	3.8	38	15	3
T17.5SHPBS2	NBA	2250	3.9	39	15	3
SL-01-C	NBA	NA	4.8	48	15	3
T16.5-SHPBS2	NBA	5330	5.3	53	15	4
SL-02-B	NBA	NA	6.3	63	15	4
SL-04-A	NBA	NA	9.6	96	15	6
P5.5-SHPBS2	NBA	1640	10.1	101	15	7
SL-02-A	NBA	NA	11.2	112	15	7
R18.5-SHPBS2	NBA	2260	11.4	114	15	8
O16-SHPBS2	NBA	1430	123	1230	15	82
Q4-SHPBS2	NBA	605	565	5650	15	377
41S&30E-4 (12-13 ft)	SBA	84	2	20	15	1
50E-1G (13-14 ft)	SBA	126	2.1	21	15	1
48E-1F (8-9 ft)	SBA	0	2.4	24	15	2
50S&50E-1 (12-13 ft)	SBA	375	2.4	24	15	2
S29-B12 (12.5-13.5 ft)	SBA	206	3.1	31	15	2
50E-1G (6-7 ft)	SBA	714	3.5	35	15	2
50E-1F (14-14.5 ft)	SBA	0	3.6	36	15	2
50S&50E-3 (7-8 ft)	SBA	0	4.1	41	15	3
S29-B12 (2-3 ft)	SBA	808	4.4	44	15	3
24N&25W-4 (13-14 ft)	SBA	105	4.4	44	15	3
50S-9E (10-11 ft)	SBA	347	4.7	47	15	3
48E1F (0-1 ft)	SBA	252	4.9	49	15	3
S18B-B2 (12.5-13.5 ft)	SBA	22	5.1	51	15	3
S29-B12 (0-1 ft)	SBA	394	5.6	56	15	4
50S&50E-5 (12.8-13.8 ft)	SBA	142	5.8	58	15	4
9E (12-13 ft)	SBA	369	8.2	82	15	5
S29-B6 (13.5-14.5 ft)	SBA	0	8.5	85	15	6
9E (5-6 ft)	SBA	1027	9.26	92.6	15	6
50S1I (12.5-13.5 ft)	SBA	175	10.3	103	15	7
48E-1F (3-4 ft)	SBA	474	11.1	111	15	7
50E-1G (2-3 ft)	SBA	960	15.7	157	15	10
50S-2H (9-10 ft)	SBA	575	15.8	158	15	11
50E-1H (3-4 ft)	SBA	1481	24.6	246	15	16
S29-B9 (2-2.5 ft)	SBA	1542	25.3	253	15	17
21E&-24N-1 (0-2 ft)	SBA	0	27.5	275	15	18
S29-B12 (8.5-9.5 ft)	SBA	1364	31	310	15	21
9E (2-3 ft)	SBA	6691	39.9	399	15	27
9G (0-2 ft)	SBA	936	50.3	503	15	34
20S-3G (0-2 ft)	SBA	166	52.4	524	15	35
6C (0-2 ft)	SBA	227	241	2410	15	161
21E-1F (0-2 ft)	SBA	0	1230	12300	15	820

*All results obtained using California WET, except B1-SHPBS2, which was analyzed using TCLP.

NA = not analyzed.

Source: ESE.

Table 5-5. Water Quality Assessment for Chromium

Location	Area	Total µg/g	DI-WET µg/L	Leachable Concentration	Beneficial Use	Required Protection
T17.5SHPBS2	NBA	434	<6.02	NA	50	NA
B1-SHPBS2*	NBA	NA	NA	NA	50	NA
M4-SHPBS2	NBA	128	7	70	50	1
T16.5-SHPBS2	NBA	879	7.8	78	50	2
R18.5-SHPBS2	NBA	443	8.1	81	50	2
SL-03-A	NBA	NA	10	100	50	2
SL-02-C	NBA	NA	10	100	50	2
SL-01-A	NBA	NA	12	120	50	2
SL-03-C	NBA	NA	14.6	146	50	3
SL-04-A	NBA	NA	15.2	152	50	3
SL-01-B	NBA	NA	16.3	163	50	3
SL-02-A	NBA	NA	16.9	169	50	3
SL-03-B	NBA	NA	17.8	178	50	4
SL-04-C	NBA	NA	20.7	207	50	4
SS 1 to 6	NBA	NA	22.4	224	50	4
SL-04-B	NBA	NA	24.9.	249	50	5
P5.5-SHPBS2	NBA	349	28.4	284	50	6
SL-01-C	NBA	NA	28.6	286	50	6
SL-02-B	NBA	NA	34.6	346	50	7
O16-SHPBS2	NBA	311	38.2	382	50	8
S21-SHPBS2	NBA	1010	45.6	456	50	9
R3.5-SHPBS2	NBA	511	68.8	688	50	14
Q4-SHPBS2	NBA	4523	110	1100	50	22
S18-B2 (12.5-13.5 ft)	SBA	16	10	100	50	2
50E-1G (13-14 ft)	SBA	5	10	100	50	2
41S&30E-4 (12-13 ft)	SBA	26	10	100	50	2
9E (12-13 ft)	SBA	5	10	100	50	2
48E-1F (3-4 ft)	SBA	233	11.7	117	50	2
S29-B9 (2.2-5 ft)	SBA	110	12.8	128	50	3
9E (2-3 ft)	SBA	171	13	130	50	3
50E-1G (6-7 ft)	SBA	57	14	140	50	3
21E&24N-1 (0-2 ft)	SBA	3	14.6	146	50	3
50E-1F (14-14.5 ft)	SBA	722	16	160	50	3
S29-B12 (0-1 ft)	SBA	35	18	180	50	4
S29-B12 (2-3 ft)	SBA	132	20	200	50	4
48E-1F (0-1 ft)	SBA	3	21	210	50	4
20S-3G (0-2 ft)	SBA	41	22	220	50	4
50S&-50E-3 (7-8 ft)	SBA	131	23	230	50	5
50E-1G (2-3 ft)	SBA	99	27	270	50	5
S29-B12 (8.5-9.5 ft)	SBA	158	31.1	311	50	6
50E-1H (3-4 ft)	SBA	368	37	370	50	7
9G (0-2 ft)	SBA	89	44.8	448	50	9
6C (0-2 ft)	SBA	18	147	1470	50	29
21E-1F (0-2 ft)	SBA	26	227	2270	50	45

*All results obtained using California WET, except B1-SHPBS2, which was analyzed using TCLP.

NA = not analyzed.

Source: ESE.

Values posted below "Required Protection" represent the factor of attenuation required to protect the beneficial use levels in groundwater. The CVRWQCB has stated that factors appropriate for SHARPE are 100 for lead and 10 for chromium. Based on this, a total of three lead and four chromium samples represent a threat to the beneficial use of groundwater.

The CVRWQCB considers the above method to be a reasonable indicator to determine if soils have the potential to degrade groundwater. SHARPE considers the test too conservative, as the severe mixing conditions employed in the DI-WET test are not representative of environmental conditions. The method by which SHARPE intends to protect groundwater is specified in Sec. 9.1.4.

6.0 SUMMARY OF SITE RISKS

The purpose of conducting a baseline risk assessment for a contaminated site is to determine if remedial action is required based on the magnitude of potential human and ecological risks associated with exposure to a site. In other words, the baseline risk assessment serves as the baseline indicating what risks could exist if no action were taken at a site. For SHARPE, a baseline risk assessment was conducted on residual contamination present in soils at the North Balloon Area, Central Area, and South Balloon Area to determine if these soils require remedial action. Both human health risks and ecological impacts are evaluated in the baseline risk assessment for SHARPE (ESE, 1994b).

Because SHARPE is a Superfund Site, the baseline risk assessment is conducted based on the methods presented in the EPA Risk Assessment Guidance for Superfund (RAGS) (EPA, 1989a and b; EPA, 1991a and b) to address both potential human and ecological exposures to site soils. In addition, applicable relevant supplements to EPA RAGS were used, as were relevant Regional EPA (i.e., Region IX) and State risk assessment guidance (DTSC, 1992). The baseline risk assessment consists of the following five primary components, each of which are described in the following sections:

1. Identification of chemicals of potential concern;
2. Exposure assessment;
3. Toxicity assessment;
4. Risk characterization; and
5. Development of cleanup criteria.

The assessments for the human and ecological risk assessment are addressed separately under each risk assessment component.

6.1 IDENTIFICATION OF COCs

The primary objectives of this component are to summarize data collected during the RI and identify COCs. Site-specific risks for each COC are discussed in the risk assessment. COCs are chemicals detected at the site at levels significantly higher than naturally occurring levels. To identify COCs, the data are evaluated to ensure that chemicals were excluded from the risk assessment if they are determined to be unrelated to the site. Evaluation of current and future land use is also important in evaluating COCs in the risk assessment, as land use will determine areas and media to be included for risk evaluation (e.g., surface soils for residential exposure). Chemicals that are not COCs must meet the following criteria:

1. Chemical is representative of background conditions (not related to the site); and
2. Chemical is introduced into a sample as part of the sample preparation and analysis procedures in the lab, and thus is not due to the site.

The principle product of COC selection is a list of COCs and concentrations in each medium (e.g., soil) for each area studied (i.e., North Balloon Area, Central Area, and South Balloon Area).

6.1.1 CURRENT AND FUTURE LAND USE AT SHARPE

Currently SHARPE is being used for storage and maintenance of military equipment; this use is expected to remain in its current land use pattern (industrial) for the foreseeable future. No known DLA plan exists to sell or change the current use of SHARPE. Offpost areas are expected to continue in current land use patterns including residential, agricultural, and light industrial, based on projected regional growth patterns through 1995. Onpost residents consist only of military personnel and their families residing in the northern and north-central areas of the North Balloon Area (Zone 1, Fig. 6-1). The entire site is fenced, with security guards at both the north and south gates. In addition, DLA security personnel regularly patrol the site for unauthorized activity.

Military personnel are usually assigned to SHARPE for relatively brief tours of duty. As a result, demographic information on residents occupying onpost housing may change significantly from year to year (ESE, 1990). Civilian workers live offpost, in either single-family homes in the small community of Lathrop, in a few apartment complexes, or in the farm households scattered around the depot. The human population located west of the site consists primarily of two housing subdivisions located southwest of SHARPE across Lathrop Road, housing located on the farmland on the west side of the depot, and a small group of people living in homes located west of the northwest corner of the SHARPE across Roth Road. Additional houses are located to the south and west along Harlan and Lathrop Roads. The 1990 U.S. Census reports show the total residential population of Lathrop to be about 7,000. Census information confirms that the land use in the region is primarily agricultural. The land use pattern in the region is not expected to change significantly in the near future.

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6.1.2 COCs AND MEDIA OF CONCERN

Generally, 0 to 2 ft is used for characterizing risks to surface soil, as this depth typically represents soils that would be included in exposure pathways. However, because the exposed surface areas at SHARPE have been routinely plowed, worked with heavy equipment, and leveled, mixing of the upper regions of the soil has occurred. Thus, based on the evaluation of the analytical data and land use conditions, the primary media of concern is surface soils designated as 0 to 5 ft-bls and fugitive dust. The COCs detected in this medium are summarized in Table 6-1 for the three onpost areas of concern.

6.2 EXPOSURE ASSESSMENT

The exposure assessment is the most critical component of a baseline risk assessment, because this is where populations or subpopulations (e.g., children), exposure pathways, and the magnitude of exposure to these populations are identified.

Table 6-1. Summary of COCs in Soil and Air for the North Balloon Area, South Balloon Area, and Central Area of SHARPE

COC	North Balloon Soil	North Balloon Air*	Central Balloon Soil	Central Balloon Air	South Balloon Soil	South Balloon Air
Organic Chemicals						
Anthracene (ANTRC)					SS	
Benzo(a)anthracene (BAANTR)					SS	
Benzo(k)fluoranthene (BKFANT)					SS	
Bis(2-ethylhexyl)phthalate (B2EHP)	NS		CS		SS	
Benzene (C6H6)			CS	CA		SA
Carbon tetrachloride (CCL4)						SA
Chlorobenzene (CLC6H5)			CS			SA
Chloroform (CHCL3)	NS		CS		SS	SA
Chrysene (CHRY)					SS	
Ethylbenzene (ETC6H5)			CS			SA
Dichlorobenzene (DCLB)			CS			
Dichlorodifluoromethane (CCL2F2)			CS			
Di-N-octylphthalate (DNOP)			CS			
1,1,1-Trichloroethane (111TCE)			CS	CA		SA
1,1-Dichloroethene (11DCE)			CS			
1,1-Dichloroethane (1lDCLE)			CS			
1,2-Dimethylbenzene (12DMB)			CS			
1,3-Dichlorobenzene (13DCLE)			CS			
1,3-Dimethylbenzene (13DMB)			CS			
Fluoranthene (FANT)					SS	
Methylene chloride (CH2CL2)				CA		SA
Phenanthrene (PHANTR)					SS	
Pyrene (PYR)					SS	
1,1,2,2-Tetrachloroethane (TCLEA)			CS			
Tetrachloroethene, (TCLEE)			CS			SA
Toluene (MEC6H6)			CS	CA		SA
trans-1,2-Dichloroethene (T12DCE)			CS			
Trichloroethylene (TRCLE)			CS		SS	SA
Xylene (XYLEN)					SS	
Vinyl chloride (C2H3CL)			CS			

Table 6-1. Summary of COCs in Soil and Air for the North Balloon Area, South Balloon Area, and Central Area of SHARPE (Continued, Page 2 of 2)

COC	North Balloon Soil	North Balloon Air*	Central Balloon Soil	Central Balloon Air	South Balloon Soil	South Balloon Air
Inorganic Chemicals						
Aluminum (AL)	NS		CS		SS	
Antimony (SS)	NS		CS			
Arsenic (AS)	NS		CS		SS	
Barium (BA)	NS		CS		SS	
Beryllium (BE)	NS					
Calcium (CA)	NS		CS		SS	
Cadmium (CD)	NS		CS			
Chromium (CR)	NS				SS	
Copper (CU)	NS		CS		SS	
Iron (FE)	NS		CS		SS	
Lead (PB)	NS		CS		SS	
Potassium (K)	NS		CS		SS	
Magnesium (MG)	NS		CS		SS	
Manganese (MN)	NS		CS			
Molybdenum (MO)			CS			
Nickel (NI)	NS		CS		SS	
Silver (AG)			CS			
Sodium (NA)	NS		CS			
Thallium (TL)	NS		CS			
Vanadium (V)	NS		CS		SS	
Zinc (ZN)	NS		CS		SS	
Pesticides						
Bromacil (BRMCIL)	NS		CS			
Chlordane (CLDAN)	NS					
DDD (PPDDD)	NS				SS	
DDE (PPDDE)	NS				SS	
DDT (DDT)	NS				SS	
Dieldrin (DLDRN)	NS					
beta-Hexachlorocyclohexane (BBHC)	NS					
Lindane (LIN)	NS					
Monuron (MONRN)	NS					

NS = North Balloon surface soil. SS = South Balloon surface soil.
CA = Central Area air. SA = South Balloon air.
CS = Central Area surface soil.

*None of the air samples had contamination after being corrected for blank concentrations.

6.2.1 POTENTIALLY EXPOSED POPULATIONS

6.2.1.1 Human Populations

The human receptor population under current land use conditions includes the workers at the facility performing the maintenance and supply missions in the North Balloon Area, Central Area, and South Balloon Area. Army personnel and families (i.e., adults and children) residing in the North Balloon Area, which includes the Administration and Housing Area (AHA), are also potential receptors. Military personnel are usually assigned to SHARPE for brief tours of duty [i.e., 2 to 3 years in duration (SJCPD, 1987)].

Onsite workers are either onpost personnel living in the housing in the North Balloon Area or civilians living offpost. Potential subpopulations of concern include the children of onsite workers, who may visit the site with their parents. Based on the nature of contamination, exposure of offpost populations to onsite soils is only a potential pathway for residential children living near the North Balloon Zone 1 who may trespass to use the track in one North Balloon area. The offpost populations of potential concern are a function of future exposure to groundwater, which is addressed as a separate OU.

6.2.1.2 Wildlife Populations

Because of the high degree of land development and management within and adjacent to SHARPE, natural resources are limited; therefore, the area does not support a great diversity of wildlife. Wildlife present at SHARPE are animals that can live on extremely limited resources within SHARPE boundaries or adjacent agricultural resources and marginal natural areas. Thus, the ecological risk assessment focuses on a limited number of species which may come into contact while in transit to viable habitats. These species include black-tailed jackrabbit, mice, burrowing owl, crop plants, and cattle. No endangered plants or animals are currently found at SHARPE. There are several species of animals listed by the U.S. Fish and Wildlife Service (USFWS) as endangered and by the State of California as threatened in areas near the SHARPE installation, but not on the installation. Candidate species for listing may potentially occur in the vicinity of SHARPE. However, due to the lack of suitable or critical habitats on the installation, endangered species or candidate species are unlikely to occur at SHARPE.

6.2.2 EXPOSURE PATHWAYS

An exposure pathway is the path whereby a chemical from a contaminated area comes into contact with a potential receptor (i.e., a worker, resident, or animal). An exposure pathway is complete only when the potential exists for a receptor to come into contact with contaminated areas of the site. Based on a review of the data, several areas were identified as areas where receptors could come into contact with contaminated soils and include:

1. North Balloon Area soils, north of Holly St. (Zone 1);
2. North Balloon Area soils, south of Holly St. (Zone 2);
3. North Balloon Area soils near Bldgs. T-40 and T-67 within Zone 2 (Zone 2a);
4. Central Area soils; and
5. South Balloon Area soils.

These areas are identified in Fig. 6-1.

Once a receptor comes into contact with contaminated soils, exposure does not occur unless there is a route by which the soil enters the body. Thus, based on the type of land use at the site, the means by which the contaminated soils can enter a human or ecological receptor's body are

incidental ingestion, dermal contact, and inhalation of dusts and vapors.

A summary of the of the human and wildlife exposure pathways included for further risk analysis are listed in Table 6-2.

6.2.3 EXPOSURE CONCENTRATIONS

Exposure concentrations are concentrations of chemicals that a potential receptor may come into contact with. For the soils risk assessment, the chemical concentrations of concern are the levels detected in surface soil at the North Balloon Area, Central Area, and South Balloon Area. To estimate how much of a chemical a human or ecological receptor may be exposed to, the monitoring data for each area of concern was used to determine the maximum concentration detected at the area, or the upper 95 percent confidence limit of the mean. Based on EPA RAGS, the lowest of the two values was used to calculate exposure for both human and ecological risk characterization.

6.2.4 ASSUMPTIONS USED TO CALCULATE CHEMICAL EXPOSURE

The degree of chemical exposure to a receptor is a function of exposure frequency and duration. Therefore, in order to determine the frequency and duration of chemical exposure, it is important to understand the type of activities that occur at the site (i.e., work or play activities) as well as the behaviors and duration associated with these activities. For the SHARPE soil risk assessment, chemical exposure was determined using exposure equations presented in EPA risk assessment guidance and using site monitoring data and site-specific exposure factors associated with worker, child recreational, and residential activities.

To calculate worker exposure, it was assumed that a worker weighs 70 kilograms and works 250 days per year for 25 years at the North Balloon Area, Central Area, and South Balloon Area. Workers are expected to incidentally ingest 50 mg of soil per day; to come into contact with soil through skin on the forearms, hands, and face; and to inhale contaminated dust during work activities.

Table 6-2. Summary of Human Exposure Pathways to COCs in Soil and Air for the North Balloon Area, South Balloon Area, and Central Area of SHARPE

Scenario	Applicable Sites	Dust Inh.	Soil Ing.	Soil Derm.
Current Recreational	North Balloon Pesticide Area (2a)		x	x
Current Residential	North Balloon North of Holly St (1)		x	x
Current Worker	North Balloon North of Holly St. (1)		x	x
	North Balloon South of Holly St. (2)		x	x
	Central Area	x	x	x
	South Balloon	x	x	x
Wildlife Exposure*	North Balloon (1)		x	
	North Balloon (2)		x	
	North Balloon (2a)		x	
	Central Area		x	
	South Balloon		x	

* Includes rodents, birds, livestock, and crop plants.

inh = inhalation.
ing = ingestion.
derm = dermal.

For child recreational exposure, it was assumed that a worker's child will play outside Bldgs. T-40 and T-67 in pesticide-contaminated soils. The child is assumed to weights 15 kilograms, and may visit the building with a parent on 50 days over 3 years. Children are expected to incidentally ingest 200 mg of soil per visit and come into contact with soil through skin on the arms, hands, face and legs.

For child and adult residents living in the onpost housing in the North Balloon Area (Zone 1), it was assumed that residents will come into contact with soil on 350 days over 3 years. Residents are expected to incidentally ingest soil during residential activities and come into contact with soil through skin.

6.3 TOXICITY ASSESSMENT

6.3.1 HUMAN TOXICITY ASSOCIATED WITH COCs

The toxicity assessment describes the potential harmful effects associated with exposures to COCs. Based on experimental evidence of exposure consequences, a chemical is classified as either a carcinogen or a noncarcinogen. Carcinogens are further classified into groups A through E by EPA based on the weight of evidence on the chemical to cause human cancer. A summary of the toxicological properties referred to as a toxicity profile is included in the risk assessment (ESE, 1994b). Each COC profile summarizes the health effects associated with exposure. In addition, the COC toxicity criteria values (reference doses for noncarcinogens and cancer slope factors for carcinogens) are identified from the most current EPA sources such as the Integrated Risk Information System, Health Effects Assessment Summary Tables, and other relevant databases or documents.

Cancer slope factors have been developed by the EPA Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic COCs. Cancer slope factors, which are expressed in units of (mg/kg/day)-l, are multiplied by the estimated intake of a potential carcinogen to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the cancer slope factor to ensure that actual cancer risks are not underestimated. Cancer slope factors are derived from the results of human epidemiological studies or chronic animal studies to which extrapolations are made to humans using uncertainty factors.

Reference doses have been developed by EPA for indicating the potential for adverse affects from exposure to COCs exhibiting noncarcinogenic effects. They are expressed in units of mg/kg/day, and are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated chemical intakes are compared to reference doses to determine if adverse effects may result from exposure to COCs at the site. Reference doses are derived from human epidemiological studies or chronic animal studies to which extrapolations are made to humans using uncertainty factors. These uncertainty factors help ensure that the reference doses will not underestimate the potential for adverse noncarcinogenic effects to occur.

The toxicity criteria used for calculating human health risks are summarized in Table 6-3.

6.3.2 ECOLOGICAL TOXICITY ASSOCIATED WITH COCs

Reference concentrations similar to those identified for human risk characterization are used to evaluate risks to wildlife. The reference concentrations, also referred to as ecotoxicity benchmarks, are either concentrations derived from field studies to measure adverse ecological effects (e.g., acute and chronic aquatic and/or soil/sediment toxicity tests) or concentrations obtained in laboratory studies which evaluate a variety of endpoints (e.g., lethal concentrations in which 50 percent of the exposed population dies, maximum acceptable toxicant concentrations, lowest observed effect level, no observable effect level, etc.). Ecotoxicity benchmarks that are relevant to the wildlife observed at the site were identified. The ecotoxicity criteria for calculating ecological risks are summarized in Table 6-4.

6.4 RISK CHARACTERIZATION

6.4.1 METHODS FOR HUMAN RISK CHARACTERIZATION

Risk characterization, the final step in the baseline risk assessment process, integrates and summarizes the toxicity and exposure assessment information to produce quantitative risks associated with exposure to site contaminants. To characterize the potential carcinogenic effects, probabilities that an individual will develop cancer over a lifetime of exposure are estimated. Excess lifetime cancer risks are determined by multiplying the intake level with the cancer slope factor. These risks are probabilities that are generally expressed in scientific notation (e.g., 1 x 10-6 or 10E-6). An excess lifetime cancer risk of 1 x 10-6 indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

Table 6.3. Summary of Toxicity Dose-Response Information Used in the Human Risk Characterization (Page 1 of 2)

Chemical	Oral RfD (mg/kg/day) Chronic	Oral RfD (mg/kg/day) Subchronic	Inh. RfD (mg/kg/day) Chronic	Inh. RfD (mg/kg/day) Subchronic	Oral CSF (mg/kg/day)-1	Oral WoE*	Inh. CSF (mg/kg/day)-1	Inh WoE*
ANIONS/CATIONS								
Chloride	7.1e+00	-	-	-	-		-	
Nitrite + nitrite	1.0e-01	1.0e-01	-	-	-		-	
INORGANICS								
Aluminum	-	-	-	-	-		-	
Antimony	4.0e-04	4.0e-04	-	-	-		-	
Arsenic	3.0e-04	3.0e-04	-	-	1.8e+00	A	5.0e+01	A
Barium	7.0e-02	7.0e-02	1.0e-04	1.0e-03	-		-	
Beryllium	5.0e-03	5.0e-03	-	-	4.3e+00	B2	8.4e+00	B2
Boron	9.0e-02	9.0e-02	-	-	-		-	
Cadmium (solid matrix)	1.0e-03	-	-	-	-		6.1e+00	B1
Calcium	-	-	-	-	-		-	
Chromium, hexavalent	5.0e-03	2.0e-02	-	-	ND		4.1e+01	A
Chromium, total	1.0e+00	1.0e+00	-	-	-		-	
Cobalt	-	-	-	-	-		-	
Copper	3.7e-02	3.7e-02	-	-	-		-	
Iron	-	-	-	-	-		-	
Lead	-	-	-	-	ND	B2	ND	B2
Magnesium	-	-	-	-	-		-	
Manganese (solid matrix)	1.4e-01	1.4e-01	1.1e-04	1.1e-04	-		-	
Molybdenum	5.0e-03	5.0e-03	-	-	-		-	
Nickel	2.0e-02	2.0e-02	-	-	-		8.4e-01	A
Phosphorus	-	-	-	-	-		-	
Potassium	-	-	-	-	-		-	
Silver	5.0e-03	5.0e-03	-	-	-		-	
Thallium	7.0e-05	7.0e-04	-	-	-		-	
Vanadium	7.0e-03	7.0e-03	-	-	-		-	
Zinc	3.0e-01	3.0e-01	-	-	-		-	
PESTICIDES								
BHC, (beta)	3.0e-04	3.0e-03	-	-	1.8e+00	C	1.9e+00	C
Bromacil	1.2e-01	-	-	-	-		-	
Chlordane, total	6.0e-05	6.0e-05	-	-	1.3e+00	B2	1.3e+00	B2
DDD,pp'	5.0e-04	5.0e-04	-	-	2.4e-01	B2	2.4e-01	B2
DDE,pp'	5.0e-04	5.0e-04	-	-	3.4e-01	B2	3.4e-01	B2
DDT,pp'	5.0e-04	5.0e-04	=	=	3.4e-01	B2	3.4e-01	B2
Dieldrin	5.0e-05	5.0e-05	-	-	1.6e+01	B2	1.6e+01	B2
Lindane	3.0e-04	3.0e-03	-	-	1.3e+00	B2/C	ND	B2/C
Monuron	1.0e-02	-	-	-	-		-	

Table 6-3. Summary of Toxicity Dose-Response Information Used in the Human Risk Characterization (Page 2 of 2)

Chemical	Oral RfD (mg/kg/day) Chronic	Subchronic	Inh. RfD (mg/kg/day) Chronic	Subchronic	Oral CSF (mg/kg/day)-1	Oral WoE*	Inh CSF (mg/kg/day)-l	Inh. WoE*
POLYCYCLIC AROMATIC HYDROCARBONS								
Anthracene	3.0e-01	3.0e+00	-	-	-		-	
Benz(a)anthracene	3.0e-02	3.0e-01	-	-	7.3e-01	B2	6.1e-01	B2
Benzo(k)fluoranthene	3.0e-02	3.0e-01	-	-	7.3e-01	B2	6.le-01	B2
Chrysene	3.0e-02	3.0e-01	-	-	7.3e-02	B2	6.le-02	B2
Fluoranthene	4.0e-02	4.0e-01	-	-	-		-	
Phenanthrene	3.0e-02	3.0e-01	-	-	-		-	
Pyrene	3.0e-02	3.0e-0l	-	-	-		-	
MISCELLANEOUS SEMIVOLATILE ORGANICS								
Bis(2-ethylhexyl)phthalate	2.0e-02	2.0e-02	-	-	1.4e-02	B2	ND	B2
Dichlorobenzene, 1,3-	-	-			-		-	
Dichlorobenzenes, total	9.0e-02	9.0e-01	4.0e-02	4.0e-01	2.4e-02	C	ND	C
Di-n-octyl phthalate	2.0e-02	2.0e-02	-	-	-		-	
MISCELLANEOUS V0LATILE ORGANICS								
Benzene	2.0e-02	-	-	-	2.9e-02	A	2.9e-02	A
Carbon tetrachloride	7.0e-04	7.0e-03	-	-	1.3e-0l	B2	5.3e-02	B2
Chlorobenzene	2.0e-02	2.0e-01	5.0e-03	5.0e-02	-		-	
Chloroform	1.0e-02	1.0e-02	-	-	6.1e-03	B2	8.1e-02	B2
Dichlorodifluoromethane	2.0e-01	9.0e-01	5.0e-02	5.0e-01	-		-	
Dichloroethane, 1,1-	1.0e-01	1.0e+00	1.0e-01	1.0e+00	ND	C	ND	C
Dichloroethene, 1,1-	9.0e-03	9.0e-03	-	-	6.0e-01	C	1.2e+00	C
Dichloroethene, trans-1,2-	2.0e-02	2.0e-01	-	-	-		-	
Ethylbenzene	1.0e-0l	1.0e+00	2.9e-01	2.9e-01	-		-	
Methylene chloride	6.0e-02	6.0e-02	8.6e-0l	8.6e-01	7.5e-03	B2	1.6e-03	B2
Tetrachloroethane, 1,1,2,2-	-	-	-	-	2.0e-01	C	2.6e-02	C
Tetrachloroethene	1.0e-02	1.0e-01	-	-	5.le-02	B2	1.8e-03	B2
Toluene	2.0e-01	2.0e+00	1.le-01	5.7e-01	-		-	
Trichloroethane, 1,1,1-	9.0e-02	9.0e-01	3.0e-01	3.0e+00	-		-	
Trichloroethene	6.0e-03	-	-	-	1.1e-02	B2	1.7e-02	B2
Vinyl chloride	-	-	-	-	1.9e+00	A	3.0e-01	A
Xylene, m-	2.0e+00	4.0e+00	2.0e-01	1.0e+00	-		-	
Xylene, o-	2.0e+00	4.0e+00	2.0e-01	1.0e+00	-		-	
Xylenes, total	2.0e+00	4.0e+00	8.6e-02	8.6e-02	-		-	

WoE = EPA weight-of-evidence of oral carcinogenicity for classifying compounds as a human carcinogen via ingestion.

A = Human carcinogen (sufficient evidence from epidemiologic studies).
B1 = Probable human carcinogen (limited evidence from epidemiologic studies).
B2 = Probable human carcinogen (sufficient evidence in animals and inadequate evidence in humans).
C = Possible human carcinogen (limited evidence of carcinogenicity in animals in the absence of human data).
D = Not classifiable as to human carcinogenicity.

Source: ESE.

Table 6-4. Compound-Specific Ecotoxicity Benchmarks for Terrestrial Organisms

COMPOUND	SCIENTIFIC NAME	COMMON NAME	TEST	EFFECT	CONC.	UNIT
1,1,1-TRICHLOROETHANE	Rattus rattus	RAT	CHRONIC		750	MG/KG
1,1,2,2-TETRACHLOROETHANE	Mus spp.	MOUSE			282	MG/KG
1,1-DICHLOROETHYLENE	Rattus rattus	RAT	CHRONIC	LOAEL	9	MG/KG
1,1-DICHLOROETHANE	Rattus rattus	RAT		NOEL	115	MG/KG
1,3-DICHLOROBENZENE	Rattus rattus	RAT			200	
1,2-DIMETHYLBENZENE	Rattus rattus/Mus sp.	Rats/Mice		NOAEL	250	MG/KG
XYLENE*	Rattus rattus/Mus sp.	Rats/Mice		NOAEL	250	MG/KG
ALUMINUM	GALLUS gallus	CHICKEN			1400	PPM
ANTHRACENE		RODENT	CHRONIC		3300	MG/KG
ANTIMONY		SMALL MAMMALS	ACUTE	LC50	11	MG/KG
ANTIMONY		SMALL MAMMALS	ACUTE	LC50	4000	MG/KG
ARSENIC	Mus Sp.	MOUSE	ACUTE		40	MG/KG
BARIUM		DOG	ACUTE	LLD	90	MG/KG-B
BARIUM		MOUSE	ACUTE	LLD	70	MG/KG-B
BARIUM		RABBIT	ACUTE	LLD	170	MG/KG-B
BARIUM		RAT	ACUTE	LD50	118	MG/KG-B
BENZENE	Rattus rattus	RAT		NOEL	1	MG/KG
BENZO (A) ANTHRACENE		RODENT	CHRONIC		2	MG/KG
BENZO (K) FLUORANTHENE		RODENT	CHRONIC		72	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	Canis familiaris	DOG		NOEL	60	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	Mesocricetus auratus	HAMPSTER		NOEL	250	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	Rattus rattus	RAT		NOEL	400	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	Rattus rattus	RAT	ACUTE	LD50	26000	MG/KG

BROMACIL	Colinus virginianus	BOBWHITE QUAIL		LC50	10000	PPM
BROMACIL	Canis familiaris	DOG	CHRONIC	NOAEL	31	MG/KG
BROMACIL	Rattus rattus	RAT	ACUTE	LD50	5200	MG/KG
BROMACIL	Rattus rattus	RAT	ACUTE	LOAEL	650	MG/KG
CADMIUM	Mus. sp	MOUSE	CHRONIC		2	MG/KG
CADMIUM	Rattus rattus	RAT	CHRONIC		0	MG/KG
CHLORDANE	Bos bovis	CALF		NOEL	10	MG/KG
CHLORDANE	Bos bovis	CATTLE		NOEL	75	MG/KG
CHLORDANE	Sturnus vulgaris	STARLING		DEATH	150	MG/KG
CHLOROBENZENE	Canis familiaris	DOG		LOAEL	55	MG/KG
CHLOROBENZENE	Canis familiaris	DOG		NOEL	27	MG/KG
CHLOROBENZENE	Rattus rattus	RAT		LOAEL	50	MG/KG
CHLOROBENZENE	Rattus rattus	RAT	ACUTE	LDSO	3400	MG/KG
CHLOROFORM	Rattus rattus	RAT		NOEL	30	MG/KG
CHLOROFORM	Rattus rattus	RAT	CHRONIC		60	MG/KG
CHRONIUM	Canis familiaris	DOG			100	MG/KG
CHRONIUM	Sylvilagus spp.	RABBIT	CHRONIC		2	MG/KG
CHROMIUM	Rattus rattus	RAT			1000	MG/KG
CHROMIUM VI		EARTHWORM	CHRONIC		10	MG/KG
CHRYSENE	Rattus rattus	RODENT	CHRONIC		99	MG/KG
COBALT	Gallus gallus	CHICKEN	ACUTE		50	MG/KG
COBALT	Rattus rattus	RAT			30	MG
COPPER	Ovis aires	LAMB			27	MG/KG
COPPER		PLANTS			150	MG/KG
COPPER	Sus scrofa	SWINE	CHRONIC		250	MG/KG
DDD	Colinus virginianus	BOBWHITE QUAIL		LC50	2178	MG/KG
DDD	Coturnix japonica	JAPANESE QUAIL		LC50	3165	MG/KG
DDD	Phasianus colchicus	RING NECKED PHEASANT		LC50	445	MG/KG
DDE	Annus platyrhynchos	MALLARD	CHRONIC		4	MG/KG

Table 6-4. Compound-Specific Ecotoxicity Benchmarks for Terrestrial Organisms (Continued, Page 2 of 2)

COMPOUND	SCIENTIFIC NAME	COMMON NAME	TEST	EFFECT	CONC.	UNIT
DDT	Phasianus colchicus	PHEASANT		LC50	311	MG/KG
DDT	Colinus virginianus	BOBWHITE QUAIL		LC50	611	MG/KG
DDT	Gallus gallus	CHICKEN		LC50	300	MG/KG
DDT		DOMESTIC FOWL			500	MG/KG
DDT		DOMESTIC FOWL			700	MG/KG
DICHLOROBENZENE	Rattus rattus	RAT	NOAEL		200	MG/KG
DICHLOROBENZENE	Rattus rattus/Mus sp.	RATS/MOUSE	NOAEL		86	MG/KG
DIELDRIN		CATTLE			25	MG/KG
DIELDRIN		CHICKS		LD50	20	MG/KG
DIELDRIN		SHARP-TAILED GROUSE		LD50	7	MG/KG
DIELDRIN		SHEEP			25	MG/KG
ETHYLBENZENE	Rattus rattus	RAT	ACUTE	LD50	3500	MG/KG
FLUORANTHENE		ACUTE LD50 2000 MG/KG				
IRON (FERROUS SULFATE)	Cavia procellus	GUINEA PIG	ACUTE	LD50	1200	MG/KG
IRON (FERROUS SULFATE)	Mus spp.	MOUSE	ACUTE	LD50	979	MG/KG
IRON (FERROUS SULFATE)	Rattus rattus	RAT	ACUTE	LD50	319	MG/KG
LEAD	Zehaiba macroura	MOURNING DOVE	CHRONIC		72	MG/KG
LEAD	Mus spp.	MOUSE	CHRONIC		7	MG/KG
LEAD		PLANTS			125	MG/KG
LEAD		PLANTS			400	MG/KG
LINDANE	Coturnix japonica	JAPANESE QUAIL			425	MG/KG
MAGNESIUM	Canis familiaris	DOG	ACUTE	LD50	230	MG/KG
MANGANESE	Bos bovis	CATTLE	CHRONIC		2	MG/KG
MOLYBDENUM	Bos bovis	CATTLE			20	PPM
MOLYBDENUM	Bos bovis	CATTLE	CHRONIC		2	MG/KG

MOLYBDENUN	Bos bovis	CATTLE	CHRONIC		141	MG/KG
MOLYBDENUM	Sylvilagus spp.	RABBIT	CHRONIC		100	MG/KG
MOLYBDENUM	Sylvilagus spp.	RABBIT	CHRONIC		1000	MG/KG
NICKEL	Rattus rattus	RAT		LOEL	50	MG/KG
NICKEL	Rattus rattus	RAT		NOEL	5	MG/KG
NICKEL	Rattus rattus	RAT	CHRONIC		20	MG/KG
PHEMANTHRENE		RODENT	ACUTE	LD50	700	MG/KG
POTASSIUM	Mus Sp.	MOUSE	ACUTE		383	MG/KG
POTASSIUM	Sylvilagus spp.	RABBIT	ACUTE		3015	MG/KG
PYRENE		RODENT	CHRONIC		99	MG/KG
SILVER	Gallus gallus	CHICKS	CHRONIC		50	MG/KG
SILVER		CROP PLANTS	CHRONIC		1000	MG/KG
SILVER	Mus. spp.	MOUSE	CHRONIC		1050	MG/KG
SILVER		NEMATODE	ACUTE		0	MG/KG
SILVER	Picea spp.	SPRUCE	CHRONIC		1400	MG/KG
TETRACHLOROETHYLENE	Bos bovis	CALF			0	MG/KG
TETRACHLOROETHYLENE		NORSE			0	MG/KG
THALLIUM		RAT/MOUSE/HAMSTER	ACUTE		15	MG/KG
TOLUENE	Rattus rattus	RAT		NOAEL	223	MG/KG
TRICHLOROETHENE		MOUSE	ACUTE		2400	MG/KG
TRICHLOROETHENE		RABBIT	ACUTE		7330	MG/KG
VANADIUM		CABBAGE			2500	MG/KG
VANADIUM	Ovis aires	LAMB			200	MG/KG
VANADIUM	Sus scrofa	PIG			200	MG/KG
VANADIUM	Rattus rattus	RAT			1	MG/KG
VANADIUM	Rattus rattus	RAT			10	MG/KG
VINYL CHLORIDE	Mus spp./Sylvilagus spp.	MICE/RABBIT	ACUTE	LC50	113000	PPM
VINYL CHLORIDE		MICE/RATS/RABBITS			500	PPM
VINYL CHLORIDE	Rattus rattus	RAT	ACUTE	LC50	150000	PPH

ZINC	Sus scrofa	PIG	CHRONIC	1000	MG/KG
ZINC		PLANTS		180	MG/KG
ZINC		PLANTS		3000	MG/KG

Source: ESE
NOTE: *= Uses same benchmark as 120MB

The magnitude of acceptable cancer risk relative to Superfund site remediation goals in the NCP generally ranges from 10-4 to 10-6 (one-in-one million) depending on the site, proposed usage, and chemicals of concern. Within this range, the level of risk that is considered to be acceptable at a specific site is a risk management decision and is decided on a case-specific basis. The acceptability of a particular level of risk is the province of risk management, where the quantitative estimates of risk are just one of many factors considered in the decision-making process. A cancer risk of 10-4 is not a de facto decision point, nor is it a "target" risk level. However, it is generally accepted that risks above this range require attention. The one-in-one million level of risk (expressed as 10-6) is often referred to as the de minimus level of risk. However, DTSC has not endorsed 10-6 as a universally acceptable level of risk.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference doses. By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or cross media. An HI exceeding 1 indicates that the potential exists for adverse health effects to an individual.

6.4.2 METHODS FOR ECOLOGICAL RISK CHARACTERIZATION

A Phase I screening risk analysis was conducted for addressing ecological risks. A Phase I screening involves comparing ecotoxicological benchmarks and potential exposure concentrations for each species of concern. The potential for adverse effects to terrestrial organisms is estimated by evaluating the ecotoxicity quotient (EQ), which is the ratio of the exposure concentration (concentration in soil), to the ecotoxicity benchmark that has been adjusted for the weight of the species of concern. Thus, much like an HI calculated for human exposure to noncarcinogens, an EQ is calculated so that an exceedance of 1 indicates a potential exists for adverse health effects to an individual.

6.4.3 SUMMARY OF RISKS

A summary of the human and ecological exposure pathways that pose risks above EPA's cumulative risk level of 1 x 10-4, an HI > 1, and/or an EQ > 1 are presented in Table 6-5. In addition, a summary of the human risk and HI results are presented in Tables 6-6 and 6-7, respectively.

Except for Zone 2a (the pesticide building area) of the North Balloon Area, the human carcinogenic risk and HIS associated with the different exposure areas (North Balloon Area, Central Area, and South Balloon Area) were below the cumulative risk level of 1 x 10-4. In Zone 2a, isolated areas of pesticide contamination resulted in potential worker and child risks of 1.1 x 10-3 and 3.1 x 10-4, respectively, which exceed the cumulative risk level of 1 x 10-4. In addition, the cumulative HIs for the worker and child exposure scenario at this area are 36 and 43, respectively. Both the cumulative risk and HI at Zone 2a is due to the presence of chlordane, dieldrin, DDD, DDE, and DDT in soil (Tables 6-6 and 6-7).

For lead and chromium, which are chemicals without established human dose-response values (e.g., reference doses or cancer slope factors), human health risks were evaluated using EPA-accepted exposure models or health-based values that are considered to be protective of human health under standard exposure conditions. For lead, a potentially carcinogenic COC at SHARPE, risk was assessed using DTSC's lead exposure model (Leadspread). Based on the lead model, it is determined that levels of lead exceeding 1,000 mg/kg at the site may pose adverse human health effects to an industrial worker. As with lead, a health-based value for chromium of 500 mg/kg

was determined as a level that should not be exceeded at the site, based on an evaluation of toxicological studies. In addition to the human health evaluation, lead and chromium also indicated potential ecological risks based on a comparison of the concentrations to acceptable ecological health-based values.

Based on the human and ecological risk characterization results, a subset of COCs may pose unacceptable human health and ecological risks at the site to include chromium, lead, chlordane, dieldrin, DDD, DDE, and DDT. This subset of chemicals are referred to as the final COCs.

To provide goals for remedial actions to achieve, the risk assessment results are used to develop preliminary health-based remediation goals (PRGs). These levels are residual contaminant concentrations that are not expected to result in unacceptable health risks under specific land use and exposure assumptions. Using RAGS, a risk assessment was conducted in reverse for the pesticides to develop PRGs that are based on acceptable risk levels. The PRGs for pesticides, lead, and chromium were developed based on an evaluation of toxicological information as well as consultation with the Regulatory agencies (e.g., EPA and State DTSC) the PRGs established for the areas of concern are presented in Table 6-8.

Table 6-5. Summary of Final COCs and Human and Ecological Exposure Pathways Posing Risk Exceedances at SHARPE

Exposure Area	Exposure Scenario	Exposure Pathway	Cum. Risk	HI	COCs Exceeding risks or His	COCs Exceeding Health-based Levels
North Balloon Pesticide Area (2a)	Child Recreational	Ingestion & Dermal	3.1 x 10-4	43	Chlordane, dieldrin, DDD,DDE,DDT	
	Worker	Ingestion & Dermal	1.1 x 10-3	36	Chlordane, dieldrin, DDD,DDE,DDT	
Zone 1	Worker and Child Residential	Ingestion Dermal, & Inhalation				Chromium, lead
Zone 2	Worker	Ingestion Dermal, & Inhalation				Lead
Central Area	Worker	Ingestion Dermal, & Inhalation				Lead
South Balloon	Worker	Ingestion Dermal, & Inhalation				Lead

Table 6-6. Summary of Health Risks Associated with Soil Exposure at SHARPE

Area	Scenario	Media	Risk	COCs
North Balloon (Zone 1)	Adult Worker	Dermal	1.4E-06	Arsenic, DDT
		Oral	1.5E-06	Arsenic
		TOTAL	2.9E-06	
	Lifetime Residential	Dermal	1E-06	Arsenic, DDT
		Oral	4.8E-06	Arsenic, DDT
		TOTAL	5.8E-06	
North Balloon (Zone 2)	Adult Worker	Dermal	3.1E-05	Arsenic, chlordane, DDE, DDT, Dieldrin
		Oral	5.8E-06	Arsenic, chlordane, DDE, DDT, Dieldrin
		TOTAL	3.7E-05	
North Balloon (Zone 2a)	Lifetime Recreational	Dermal	7.AE-06	Arsenic, chlordane, DDE, DDT, Dieldrin
		Oral	4.8E-06	Arsenic, chlordane, DDE, DDT, Dieldrin
		TOTAL	1.2E-05	
North Balloon (Zone 2a) "Hotspot"	Lifetime Recreational	Dermal	2.0E-04	Chlordane, DDD, DDE, DDT, Dieldrin
		Oral	1.1E-04	Chlordane, DDD, DDE, DDT, Dieldrin
		TOTAL	3.1E-04	
North Balloon (Zone 2a) "Hotspot"	Adult Worker	Dermal	9.4E-04	Chlordane, DDD, DDE, DDT, Dieldrin
		Oral	1.2E-04	Chlordane, DDD, DDE, DDT, Dieldrin
		TOTAL	1.1E-03	
Central Area	Adult Worker	Dermal	4E-06	Arsenic, misc. volatile organics
		Oral	1.8E-06	Arsenic
		Inhalation	2.7E-06	Benzene, methylene chloride
		TOTAL	8.5E-06	
South Balloon	Adult Worker	Dermal	1.4E-06	Arsenic, PAHs
		Oral	1.4E-06	Arsenic
		Inhalation	1.1E-05	Benzene, carbon tetrachloride, chloroform, tetrachloroethene
		TOTAL	1.4E-05	

PAHs = polycyclic aromatic hydrocarbons.

Source: ESE.

Table 6-7. Summary of Hazard Indices Associated with Soil Exposure at SHARPE

Area	Scenario	Media	HI	COCs Contributing to HI > 1
North Balloon (Zone 1)	Adult Worker	Dermal	0.2	
		Oral	0.3	Lead*
		TOTAL	0.5	
	Adult Residential	Dermal	0.1	
		Oral	0.1	Lead*
		TOTAL	0.3	
	Child Residential	Dermal	0.2	
		Oral	1.2	Thallium, Lead*, Chromium*
		TOTAL	1.4	
North Balloon (Zone 2)	Adult Worker	Dermal	0.8	
		Oral	0.2	Lead*
		TOTAL	1.0	
North Balloon (Zone 2a)	Child Recreational	Dermal	0.8	Chlrodane
		Oral	0.5	Chlordane
		TOTAL	1.3	
North Balloon (Zone 2a) "Hotspot"	Child Recreational	Dermal	28.1	Chlordane, DDT
		Oral	14.5	Chlordane, DDT
		TOTAL	42.6	
North Balloon (Zone 2a) "Hotspot"	Adult Worker	Dermal	31.5	Chlordane, DDT
		Oral	3.8	Chlordane, DDT
		TOTAL	35.3	
Central Area	Adult Worker	Dermal	0.2	
		Oral	0.3	Lead
		Inhalation	0.0	
		TOTAL	0.6	
South Balloon	Adult Worker	Dermal	0.02	
		Oral	0.02	Lead*
		Inhalation	0.1	
		TOTAL	0.1	

PAHs = polycyclic aromatic hydrocarbons.

*lead and chromium exceeded health-based values.

Source: ESE.

7.0 DESCRIPTION OF ALTERNATIVES

The presentation of alternatives has been subdivided into two sections: (1) alternatives for lead- and chromium-contaminated soils, and (2) alternatives for TCE-contaminated soils. The Soils FS for SHARPE, which presented the alternatives below, was accepted by EPA and the State of California in December 1994. Table 6-8 presents PRGs based on the RA. Final cleanup standards are presented in Sec. 9.0. Alternatives for the remediation of pesticide-contaminated soils were not developed in the FS. As previously stated, these soils were remediated as a non-time critical response action, under the authority of a Removal Action Memorandum (ESE 1994). This removal action was completed in March 1995.

Sites which were recommended for NFA are not included in the Description of Alternatives or Evaluation of Alternatives sections (7.0 and 8.0, respectively). More information regarding NFA sites is presented in Sec. 9.3.

7.1 LEAD- AND CHROMIUM-CONTAMINATED SOIL

SHARPE, USAEC, DTSC, CVRWQCB, and EPA have evaluated five remedial alternatives for lead- and chromium-contaminated soils:

1. Alternative 1C--Containment: Asphalt Cap;
2. Alternative 2A--Treatment: Physical /Chemical Treatment--Fixation/Solidification;
3. Alternative 3B--Treatment: Chemical Extraction/Soil Washing;
4. Altemative 4B--Removal and Disposal: Offsite Landfill; and
5. Alternative 5A--No Action: Limit Access/Use Restrictions.

Cleanup Standards

The RA presented PRGs (Table 6-8) for lead, chromium, and five pesticides (DDD, DDT, DDE, dieldrin, and chlordane) (see Sec. 9.0 for final cleanup standards). As previously stated, the pesticides were remediated with the removal action at the pesticide management area completed in March 1995. Therefore, cleanup standards for pesticides are not presented in this ROD.

Table 6-8. COCs and PRGs to be Evaluated in the ROD for SHARPE Soils (mg/kg)

Area	COC	UCL95	Mean	Maximum	Frequency of Detection	PRG	Basis of PRG
North Balloon (TBC)	Lead	4.72E+06	2.04E+05	5.75E+03	66/74	1,000	California To be Considered
Zone 1							Health-Based Criteria
	Chromium	2.26E+05	1.26E+04	1.01E+03	53/57	500	Hammond TBC Health-Based Criteria
North Balloon	Lead	3.07E+03	1.64E+03	4.11E+03	5/6	1,000	California TBC Health-Based Criteria
Zone 2							
	Dieldrin	1.26E-01	6.23E-02	2.75E-01	18/66	0.04	Risk-based
	DDT	1.64E+01	6.13E+00	1.81E+02	50/66	2	Risk-based
	DDE	5.23E+00	2.16E+00	3.15E+01	45/66	2	Risk-based
	DDD	9.06E-01	3.82E-01	8.14E+00	32/66	3	Risk-based
	Chlordane	9.78E+00	3.34E+00	4.70E+02	49/59	1	Risk-based
North Balloon	Chlordane	9.78E+00	3.34E+00	4.70E+02	49/59	1	Risk-based
Zone 2a							
	Dieldrin	4.03E-02	2.34E-02	2.75E-01	18/59	0.04	Risk-based
	DDT	2.62E+01	8.32E+00	1.81E+02	50/60	2	Risk-based
	DDE	7.29E+00	2.61E+00	3.15E+01	45/59	2	Risk-based
	DDD	8.20E-01	3.21E-01	8.14E+00	32/59	3	Risk-based
Central Area	Lead	1.34E+04	2.15E+02	3.72E+03	6/12	1,000	California TBC Health-Based Criteria
South Balloon	Lead		2.58 E+03	3.99E+03	2/2	1,000	California TBC Health-Based Criteria
Hot Spot-- Trench 1							
Hot Spot--5	Lead		2.26E+04	2.75E+04	2/2	1,000	California TBC Health-Based Criteria

Source: ESE.

During the FS, 1,000 mg/kg was selected as the cleanup standard for lead. The CVRWQCB commented that the 500 mg/kg cleanup standard for chromium was probably not protective of groundwater, and recommended a level of 300 mg/kg. Consequently, the cleanup standard for chromium was established at 300 mg/kg. In summary, the following apply to remedial response actions pertaining to lead- and chromium-contaminated soils:

Lead Cleanup Standard	1,000 mg/kg
Chromium Cleanup Standard	300 mg/kg

Based on the above cleanup standards, the total volume of lead- and chromium-contaminated soils above cleanup standards is estimated as 2,825 yd3 (2,085 yd3 in the South Balloon Area and 740 yd3 in the North Balloon Area). The total area represented by this volume, which should be considered in estimating the area and volume of soils to be remediated, is 68,050 ft2 (28,150 ft2 in the South Balloon Area and 39,900 ft2 in the North Balloon Area).

7.1.1 ALTERNATIVE 1C--C0NTAINMENT: ASPHALT CAP

Altemative IC (Asphalt Cap) consists of containment of the contaminated soils. Containment of soils would be accomplished with the construction of an asphalt cap.

The asphalt cap is the minimum cap design that would be considered. A more protective cap may be required, depending on waste characteristics. The cap would prevent worker and child exposure to lead- and chromium-contaminated soil and limit infiltration of rainfall and stormwater into contaminated areas.

Two caps would be constructed with this alternative, one in the North Balloon Area and one in the South Balloon Area. Soil from smaller contaminated areas would be excavated and transported to the larger area, where it would be evenly applied and covered by the cap. This approach would reduce the number of caps required to implement this alternative. Soils from smaller contaminated areas would be tested prior to excavation to ensure that only those soils that do not contain hazardous STLC levels are excavated and transported to the larger area. If soils are determined to be hazardous by STLC, they would be transported offsite to an appropriately licensed waste disposal facility.

This alternative would be compliant with all ARARs:

- 22 CCR Div. 4.5, Chapter 14, Article 14, §§66264.310 -- Closure of areas with lead and chromium exceeding cleanup standards will involve installation of a final cover designed and constructed to prevent downward entry of water, function with minimum maintenance, promote drainage and minimize erosion, accommodate settling and subsidence, and accommodate lateral and vertical shear forces generated by the maximum credible earthquake.

- Water Quality Control Plan (Basin Plan) for CVRWQCB -- Defines beneficial use levels for constituents in groundwater.

- State Water Resource Control Board Resolution No. 88-63, "Sources of Drinking Water Policy" as contained in the CVRWQCB Water Quality Control Plan -- Specifies that with certain exceptions, all ground and surface waters have the beneficial use of municipal or domestic water use.

- 22 CCR Div. 4.5, Chapter 14, Article 6, §§ 66264.90 et seq. -- Detection monitoring and evaluation monitoring programs for lead and chromium will be instituted. If monitoring data indicates the beneficial uses of groundwater are not being protected, corrective action may be required.

The total present-worth cost for this alternative is $388,600; time required to achieve remedial response objectives is estimated at 2 months.

7.1.2 ALTERNATIVE 2A--TREATMIENT:
PHYSICAL/CHEMICAL--FIXATION/SOLIDIFICATION

Alternative 2A (Fixation/Solidification) consists of immobilizing contaminants in soils through the process of fixation/solidification. The objective of this alternative would be to prevent adult worker exposure to soils with lead and chromium concentrations in excess of cleanup standards and to limit the mobility of the contaminants present in oils. All contaminated soil would be excavated and solidified in a portable solidification unit prior to being replaced in the excavation area.

It is anticipated that a 20- to 25-percent increase in the volume of the soil would take place as a result of this treatment process. After all contaminated soil is treated, the solidified soils (consisting of approximately 3,530 yd3) would be replaced in the excavated area. An asphalt cap would then be constructed to prevent human exposure to the solidified matrix and to alleviate the infiltration of rainfall and stormwater into the matrix..

Bench-scale tractability tests would be conducted to select the proper additives and their relative ratios and to determine the curing time required to set the waste adequately. Leaching tests and compressive strength tests would be conducted to determine the integrity of the solidified soils.

The proposed fixation/solidification treatment area would require some site preparation prior to mobilization of the process components. A temporary holding area would also be required to store excavated soil awaiting treatment in the solidification unit. This temporary holding area would be managed to prevent runoff, wind dispersion, and dermal contact. Any boulders present in the excavated soil would be removed prior to treatment and pressure-washed for decontamination.

This alternative would be compliant with all ARARs:

> 22 CCR Div. 4.5, Chapter 14, Article 16 -- If excavated soils are determined to be hazardous by characteristic, regulations addressing environmental performance standards, monitoring, analysis, inspection, response, reporting, corrective action, and post-closure care for treatment systems categorized as Miscellaneous Units need to be complied with.

The following ARARs apply to areas where lead- and chromium-contaminated soils are determined to be a potential threat to water quality:

- Water Quality Control Plan (Basin Plan) for CVRWQCB -- Defines beneficial use levels for constituents in groundwater.

- State Water Resource Control Board Resolution No. 88-63, "Sources of Drinking Water Policy" as contained in the CVRWQCB Water Quality Control Plan -- Specifies that with certain exceptions, all ground and surface waters have the beneficial use of municipal or domestic water use.

- 22 CCR Div. 4.5, Chapter 14, Article 6, §§ 66264.90 et seq. -- Detection monitoring and evaluation monitoring programs for lead and chromium will be instituted with this program. If monitoring data indicates the beneficial uses of groundwater are not being protected, corrective action may be required.

Through the process of solidification/fixation, this alternative is protective of human health and environment via treatment.

The total present-worth cost for this alternative is $1,015,000; time to achieve remedial response objectives is estimated at 8 months.

7.1.3 ALTERNATIVE 2B: CHEMICAL EXTRACTION/SOIL WASHING

Alternative 2B (Chemical Extraction/Soil Washing) for lead- and chromium-contaminated soils involves excavating soil followed by transportation to a mobile treatment unit. The objective of this process is to chemically treat lead- and chromium-contaminated soils to levels below cleanup standards. To accomplish this objective, contaminated soil would be excavated and chemically treated in a portable soil washing unit which could be transported from one area of the installation to another area as needed. After treatment, the soils would be transported to a temporary soil staging area near the treatment unit. Soils at the staging area would be stored until an analytical evaluation of the treated soils had been conducted. To minimize human and environmental exposure, soil stored at the staging area would be covered by plastic tarps. Covering the treated soils with a tarp would minimize stormwater infiltration and reduce the possibility of dermal contact.

The treated soils from the soil washing unit would retain a high water content; therefore, the possibility exists for the generation of leachate. Any leachate would be collected by constructing a series of perforated polyvinyl chloride (PVC) leachate collection pipes. The leachate collection pipes would be covered with pea gravel and overlain with a 1-ft layer of free draining sand. Leachate piping would be connected to a sump which would be sampled and chemically screened for the target parameters. If the results of soil sampling indicate adequate treatment has not been accomplished, soil would be reprocessed through the soil treatment unit. After the soil contaminant concentrations have been verified to be below the cleanup standards, treated soils would be transported to the excavation site, and the excavation would be backfilled.

One of three methods of soil washing may be utilized with this alternative. In the first method, acid is used to solubilize metal ions, followed by settling of soils and a hydroxide precipitation of the metal. All soil is washed and neutralized before being returned to the excavation. High clay content soils are unsuitable for this process.

A second method would use a chelating agent, EDTA, to complex metal cations from solution, and a calcium solution to regenerate the EDTA. The metal and EDTA floc would float to the top of the slurry. No acid is used in this method.

A third method uses alkaline and surfactants to change interfacial tension of the metal particles, causing them to floc and float to the surface. High clay content in soil would hinder the effectiveness of this process.

The chemical extraction/soil washing treatment process is expected to generate a lead and chromium sludge waste and leachate. The composition of the waste cannot be predetermined without bench- or pilot-scale tests to determine the optimum treatment process. However, after these wastes are generated, they would be collected, managed as hazardous wastes, and transported to a hazardous waste management facility.

Soil excavations would be kept as small as possible. Backfilling would be completed in 1-ft lifts (or less) and compacted to a pre-defined density. Density testing on every other lift would be performed to verify the effectiveness of compaction efforts.

This alternative would be compliant with all ARARs:

22 CCR Div. 4.5, Chapter 14, Article 16 -- If excavated soils are determined to be hazardous by characteristic, regulations addressing environmental performance standards, monitoring, analysis, inspection, response, reporting, corrective action, and post-closure care for treatment systems categorized as Miscellaneous Units need to be complied with.

The following ARARs apply to areas where lead- and chromium-contaminated soils are determined to be a potential threat to water quality:

- Water Quality Control Plan (Basin Plan) for CVRWQCB -- Defines beneficial use levels for constituents in groundwater.

- State Water Resource Control Board Resolution No. 88-63, "Sources of Drinking Water Policy" as contained in the CVRWQCB Water Quality Control Plan -- Specifies that with certain exceptions, all ground and surface waters have the beneficial use of municipal or domestic water use.

- 22 CCR Div. 4.5, Chapter 14, Article 6, §§ 66264.90 et seq. -- Detection monitoring and evaluation monitoring programs for lead and chromium will be instituted with this program. If monitoring data indicates the beneficial uses of groundwater are not being protected, corrective action may be required.

Through the process of chemical extraction/soil washing, this alternative is protective of human health and environment via treatment.

A significant level of bench- and pilot-scale testing is required, as this technology is still considered to be innovative. The total present-worth cost for this alternative is $1,773,400; time required to achieve remedial response actions is estimated at 8 months.

7.1.4 ALTERNATIVE 4B--REMOVAL AND DISPOSAL: OFFSITE LANDFILL

The objective of this alternative is to excavate lead- and chromium-contaminated soils from the North Balloon Area and South Balloon Area such that the residual soil concentrations do not exceed the respective cleanup standards. The contaminated soils would be excavated from the site and transported offsite for final disposal.

Prior to excavation of the contaminated soils, any existing pavement, concrete, and light brush would be removed using a front-end loader. Contaminated debris would be staged for transportation to an appropriately permitted offsite disposal facility.

Contaminated soils would be excavated from each area using a hydraulic backhoe or similar equipment. The surface area of the working face would be kept as small as possible to minimize the release of fugitive dust emissions. Contaminated soils would be loaded onto 20-yd3 dump trucks. Soils remaining in each excavation pit would be analyzed for lead and chromium to ensure that contamination in excess of the cleanup standards was removed and transported to an appropriately licensed offsite landfill.

Testing would be conducted to determine if any soils were hazardous by characteristic. If soils were determined to be hazardous by characteristic, the excavated soils would be disposed of in a Class I facility. If soils were determined to be non-hazardous, they would be disposed of at a Class II facility.

Approximately 2,825 yd3 of additional soil would be needed to complete backfilling and to return the affected area to existing grade. This additional soil may be available from sites at SHARPE and/or from offsite locations. Backfill material would be placed in 1-ft lifts (or less) and compacted to achieve a predetermined density. Density testing on every other lift would be performed to verify the effectiveness of compaction efforts.

No ARARs were identified for the removal and disposal of soils containing lead and chromium in excess of cleanup standards. The following ARARs apply to areas where lead- and chromium-contaminated soils are determined to be a potential threat to water quality:

- Water Quality Control Plan (Basin Plan) for CVRWQCB -- Defines beneficial use levels for constituents in groundwater.

- State Water Resource Control Board Resolution No. 88-63, "Sources of Drinking Water Policy" as contained in the CVRWQCB Water Quality Control Plan -- Specifies that with certain exceptions, all ground and surface waters have the beneficial use of municipal or domestic water use.

- 22 CCR Div. 4.5, Chapter 14, Article 6, §§ 66264.90 et seq. -- Detection monitoring and evaluation monitoring programs for lead and chromium will be instituted with this program. If monitoring data indicates the beneficial uses of groundwater are not being protected, corrective action may be required.

Through the process of offsite disposal, this alternative is protective of human health and the environment via engineering controls.

The total present-worth cost for this alternative is $683,000. Time to achieve remedial response objectives is estimated at 4 months.

7.1.5 ALTERNATIVE 5A--NO ACTION: LIMIT ACCESS/USE RESTRICTIONS

Alternative 5A (No Action) for the lead- and chromium-contaminated soils is the no-action alternative using land access restrictions. This alternative would provide limited protection of human health and the environment and is included as a baseline for comparison with other alternatives. A permanent fence (with appropriate warning signs) would be constructed around the perimeter of each site with levels of lead and chromium in excess of cleanup standards to prevent access to the sites and to prevent exposure to contaminated soils.

This alternative involves no action, aside from periodic monitoring and institutional controls. The following ARARs would not be complied with:

- Water Quality Control Plan (Basin Plan) for CVRWQCB -- Defines beneficial use levels for constituents in groundwater.

- State Water Resource Control Board Resolution No. 88-63, "Sources of Drinking Water Policy" as contained in the CVRWQCB Water Quality Control Plan -- Specifies that with certain exceptions, all ground and surface waters have the beneficial use of municipal or domestic water use.

- 22 CCR Div. 4.5, Chapter 14, Article 6, §§ 66264.90 et seq. -- Detection monitoring and evaluation monitoring programs for lead and chromium will be instituted with this program. If monitoring data indicates the beneficial uses of groundwater are not being protected, corrective action may be required.

The total present-worth cost for this alternative is $52,000; time to achieve remedial response objectives is estimated at 1 month.

7.2 TCE-CONTAMINATED SOIL

Five remedial alternatives were evaluated for TCE-contaminated soils:

1. Alternative 2B--Thermal Treatment: Onsite Incineration;
2. Alternative 2C--Physical Treatment: In-Situ Volatilization (ISV)
3. Alternative 3A--Innovative Treatment: Low-Temperature Thermal Stripping (LTTS);
4. Alternative 4A--Removal and Disposal: Offsite Landfill; and
5. Alternative 5A--No Action: Limit Access/Use Restrictions.

The RA showed that levels of TCE in soils do not represent a threat to human health and the environment, given the currently operating groundwater remediation systems. However, if TCE in soils is left untreated, it will be allowed to leach to groundwater and likely increase the time required for the actions specified in OUI to achieve aquifer cleanup standards. For this reason, remediation of TCE-contaminated soils is being undertaken.

For the purposes of comparison of alternatives, it was assumed the entire volume of TCE-contaminated soils (see Sec. 5.1) would require remediation.

The total estimated volume of TCE-contaminated soils to be remediated is estimated as 73,300 yd3.

7.2.1 ALTERNATIVE 2B--THERMAL TREATMENT: ONPOST INCINERATION

The objective of this alternative is to provide thermal treatment of TCE-contaminated soils and to reduce TCE concentrations in the ash. The TCE-contaminated soils would be incinerated onsite using a mobile incinerator. This unit would consist of a rotary kiln unit with a secondary combustion chamber, packed tower, and jet scrubber. In general, a 1.5- to 2-acre area would be needed for the incinerator operations, which would include staging and ash storage areas. The temporary storage area for soils awaiting incineration would be managed to prevent runoff, wind dispersion, and dermal contact. Any boulders present in the soil would be removed from the waste stream and jet washed for decontamination.

Incineration rates would be maintained to ensure appropriate destruction efficiencies are achieved and to comply with particulate standards and emission standards and guidelines. Periodic monitoring of the stack gases would be conducted to ensure compliance with the emissions standards and guidelines.

Ash would be stored at the incinerator complex until analyses had been completed which verified that all contaminant concentrations were below pre-defined levels. Offsite laboratories would be used to provide these analyses. If required contaminant removal is not obtained for any ash sample, the corresponding pile would be fed back into the incinerator for additional treatment.

Upon completion of the incineration operations, the incinerator would be decontaminated and removed from the site. Wastes generated during decontamination would be collected and transported to a licensed facility for disposal.

The ash resulting from incineration would be used as backfill in the excavations. It is anticipated that a 15- to 20-percent volume reduction of the soil would take place as a result of incineration. Consequently, approximately 14,660 yd3 of additional soils would be needed to complete backfilling of the excavated areas. These additional soils may be available from sites

at SHARPE and/or from offsite.

No ARARs were identified for the incineration of TCE-contaminated soils (TCE-contaminated soils are not expected to be hazardous by characteristic). The following ARARs apply to areas where TCE-contaminated soils are determined to be a potential threat to water quality:

- Water Quality Control Plan (Basin Plan) for CVRWQCB -- Defines beneficial use levels for constituents in groundwater.

- State Water Resource Control Board Resolution No. 88-63, "Sources of Drinking Water Policy" as contained in the CVRWQCB Water Quality Control Plan -- Specifies that with certain exceptions, all ground and surface waters have the beneficial use of municipal or domestic water use.

- 22 CCR Div. 4.5, Chapter 14, Article 6, §§ 66264.90 et seq. -- Detection monitoring and evaluation monitoring programs for TCE will be instituted with this program. If monitoring data indicates the beneficial uses of groundwater are not being protected, corrective action may be required.

The total present-worth cost for this alternative is $137,000,000; time required to achieve remedial response actions is estimated as 30 months.

7.2.2 ALTERNATIVE 2C--PHYSICAL TREATMENT: ISV

ISV is accomplished by using a vacuum extraction system (VES) to induce airflow from the subsurface soils to a vapor extraction point. The air from the subsurface is removed via the vapor extraction point by an air blower, thus creating a negative pressure or vacuum in the subsurface soils. The airflow and vacuum condition in the subsurface soils induces contaminants to volatilize from the adsorbed phase to the vapor phase. The ISV offgases are then removed via the vapor extraction point and treated prior to discharge to the atmosphere.

Implementation of ISV at SHARPE could consist of separate ISV systems operating independently to remediate separate areas of contamination. Each ISV system could consist of a positive displacement blower manifolded to a series of extraction network piping which, in turn, is connected to the vapor extraction wells (VEWs). A condensate separator would be used just prior to the blower to remove moisture from the contaminated air stream. The condensate separator would contain control switches and solenoid valves which would dump condensate to a collection tank once the condensate separator is full. A bleed air inlet valve would be located in the vacuum manifold piping between the blower and the condensate separator. The vapor extraction manifold network would consist of PVC aboveground piping. VEWs would consist of recovery wells screened from approximately 10 to 20 ft-bls. The selected technology for ISV offgas treatment is vapor-phase-activated carbon.

This alternative would be compliant with all ARARs:

Air Pollution Control District Rules and Regulations (Rule 2201) -- new emission sources must comply with implementation of Best Available Control Technology (BACT). Offgases from the treatment system will be treated with gas-phase carbon adsorption prior to being discharged to the atmosphere.

The following ARARs apply to areas where TCE-contaminated soils are determined to be a potential threat to water quality:

- Water Quality Control Plan (Basin Plan) for CVRWQCB -- Defines beneficial use levels for constituents in groundwater.

- State Water Resource Control Board Resolution No. 88-63, "Sources of Drinking Water Policy" as contained in the CVRWQCB Water Quality Control Plan -- Specifies that with certain exceptions, all ground and surface waters have the beneficial use of municipal or domestic water use.

- 22 CCR Div. 4.5, Chapter 14, Article 6, §§ 66264.90 et seq. -- Detection monitoring and evaluation monitoring programs for TCE will be instituted with this program. If monitoring data indicates the beneficial uses of groundwater are not being protected, corrective action may be required.

The total present-worth cost for this alternative is $528,000; time to achieve remedial response actions is estimated at 24 months.

7.2.3 ALTERNATIVE 3A--INNOVATIVE TECHNOLOGIES: LOW-TEMERATURE THERMAL STRIPPING

The low-temperature thermal unit operates at temperatures up to 450ºF to evaporate the VOCs present in the soils through the application of these soils to an indirect heat exchanger. Vaporized contaminants can either be destroyed through a secondary high-temperature combuster, collected through condensate, or adsorbed onto activated carbon.

In this alternative, contaminated soils would be excavated and stockpiled in an area adjacent to the treatment unit for feeding into a scalping screen to remove oversized (+2 inch) material and debris. Screened material would then be transported by a drag conveyor to a hopper that directly feeds the thermal processor. The temporary storage area for the soils awaiting treatment would be managed to prevent runon/runoff, wind dispersion, and dermal contact. Any oversized material removed from the soil would be decontaminated by pressure wash, if necessary.

The thermal processor is an indirectly heated, auger-type heat exchanger for solids and slurries. The processor mixes, conveys, agitates, and heats the contaminated soils, allowing the moisture, volatiles, and semivolatiles to vaporize and escape from the soil. The operating temperature of the processor, approximately 450ºF [204 degrees Celsius (ºC)], minimizes the thermal load, but still allows vaporization. In the portable system, two thermal processors, each with four 18-inch diameter, 20-ft long screws, are operated in sequence to induce adequate residence time and agitation.

Treatment rates would be maintained to ensure destruction efficiencies would achieve levels which do not threaten groundwater. Periodic monitoring of the stack gases would be conducted to ensure compliance with emissions standards and guidelines. Treated soil would be stored at the site until analyses verifies that the required level of destruction has been attained. Offsite laboratories would be used to provide these analyses. If the required residual concentrations are not obtained for any treated soil sample, the corresponding treated soil pile would be fed back into the thermal processor for additional treatment. Once the soil concentrations are reduced to levels that meet the cleanup criteria, they can be returned to the original excavations or used as backfill in other areas.

Upon completion of thermal processing, the processor would be decontaminated and removed from the site. Wastes generated during decontamination would be collected and disposed of away from the original excavated area.

The treated soil resulting from the thermal processing would be used as backfill in the excavated area. It is anticipated that a volume reduction of no greater than 5 percent would take place in the soil as a result of the thermal process. Consequently, only a small amount of soils would be needed to complete backfilling of the excavated areas and to bring these areas back to the existing grade. Treated soil would be backfilled, achieving a predetermined density. Density testing would be performed to verify the effectiveness of these compaction efforts. A topsoil layer would then be applied to the surface of the treated soil backfill.

This alternative would be compliant with all ARARs:

> Air Pollution Control District Rules and Regulations (Rule 2201) -- new emission sources must comply with implementation of Best Available Control Technology (BACT). Offgases from the treatment system will be treated with gas-phase carbon adsorption prior to being discharged to the atmosphere.

The following ARARs apply to areas where TCE-contaminated soils are determined to be a potential threat to water quality:

- Water Quality Control Plan (Basin Plan) for CVRWQCB Defines beneficial use levels for constituents in groundwater.

- State Water Resource Control Board Resolution No. 98-63, "Sources of Drinking Water Policy" as contained in the CVRWQCB Water Quality Control Plan -- Specifies that with certain exceptions, all ground and surface waters have the beneficial use of municipal or domestic water use.

- 22 CCR Div. 4.5, Chapter 14, Article 6, §§ 66264.90 et seq. -- Detection monitoring and evaluation monitoring programs for TCE will be instituted with this program. If monitoring data indicates the beneficial uses of groundwater are not being protected, corrective action may be required.

The total present-worth cost for this alternative is $6,800,000; time to achieve remedial response objectives is estimated at 16 months.

7.2.4 ALTERNATIVE 4A-REMOVAL AND DISPOSAL: OFFSITE LANDFILL

The objective of this remedial technology is to physically remove the TCE-contaminated soils from the South Balloon Area, North Balloon Area, and Central Area. The contaminated soils would be excavated and transported offsite for final disposal in a landfill.

Prior to excavation of the contaminated soils, any existing pavement, concrete, and light brush would be removed using a front-end loader. Contaminated debris and soils would be staged for transportation to an offsite disposal facility.

Contaminated soils would be excavated from each area using a hydraulic backhoe or similar equipment. The surface area of the working face would be kept as small as possible to minimize the release of VOCs and fugitive dust emissions. Contaminated soils would be loaded onto 20-yd3 dump trucks. Soils remaining in each excavation pit would be analyzed to ensure that all soils which threaten groundwater are removed and transported to the offsite disposal landfill.

Final disposal of TCE-contaminated soils is dependent on the results of TCLP analyses. Land disposal is a viable alternative if a TCLP analysis yields TCE concentrations in the leachate of less than 0.500 mg/L. If TCE concentrations in the leachate exceed 0.500 mg/L, soils would be transported offsite to an appropriately permitted treatment, storage, or disposal facility.

Additional soil would be needed to complete backfilling the excavated areas and to return the affected areas to existing grade. This additional soil may be available from sites at SHARPE and/or from offsite locations. Backfill material would be placed in 1-ft lifts (or less) and compacted to achieve a predetermined density. Density testing on every other lift would be performed to verify the effectiveness of compaction efforts.

No ARARs were identified for the removal and disposal of soils containing TCE. The following ARARs apply to areas where TCE-contaminated soils are determined to be a potential threat to water quality:

- Water Quality Control Plan (Basin Plan) for CVRWQCB -- Defines beneficial use levels for constituents in groundwater.

- State Water Resource Control Board Resolution No. 88-63, "Sources of Drinking Water Policy" as contained in the CVRWQCB Water Quality Control Plan -- Specifies that with certain exceptions, all ground and surface waters have the beneficial use of municipal or domestic water use.

- 22 CCR Div. 4.5, Chapter 14, Article 6, §§ 66264.90 et seq. -- Detection monitoring and evaluation monitoring programs for TCE will be instituted with this program. If monitoring data indicates the beneficial uses of groundwater are not being protected, corrective action may be required.

The total present-worth cost for this alterriative is $23,000,000. Time to achieve remedial response objectives is estimated at 8 months.

7.2.5 ALTERNATIVE 5A--NO ACTION: LIMIT ACCESS/USE RESTRICTIONS

Alternative 5A (No Action) for the TCE-contaminated soils at the North Balloon Area, South Balloon Area, and Central Area is a no-action alternative using groundwater sampling and analysis to assess further groundwater contamination. This alternative is included as a baseline for comparison with other alternatives. This alternative does not minimize transport of TCE to groundwater caused by percolation of runoff through overlying TCE-contaminated soils.

A complete round of sampling and analysis of surficial monitor wells in the vicinity of the soils contamination would be conducted annually to monitor the effect of not remediating the contaminated soils. In addition, a report would be prepared every 5 years detailing the groundwater monitoring effort.

No ARARs were identified for this alternative.

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

Evaluation of nine criteria is required under the NCP and Sec. 121 of CERCLA for use in evaluation of remedial alternatives. The nine criteria are as follows:

THRESHOLD FACTORS

Overall Protection of Human Health and the Environment -- Addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Compliance with ARARs -- Site remediation should comply with federal and state laws that apply to the project. This criteria evaluates whether or not a remedy will meet all ARARs of federal

and state environmental statutes. If the remedy does not comply with ARARs of federal and state environmental statutes, this section should specify grounds for invoking an ARAR waiver.

PRlMARY BALANCING FACTORS

Short Term Effectiveness -- Addresses the period of time needed to complete the remedy and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until the cleanup goals are achieved.

Long-Term Effectiveness and Performance -- Refers to the ability or remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

Reduction of Mobility, Toxicity, and Volume (MTV) through Treatment -- Refers to the anticipated ability of a remedy to reduce the mobility, toxicity, and volume of the hazardous components present at the site.

Implementability -- Refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to carry out a particular option.

Cost -- Evaluates the estimated capital, operation, and maitenance costs of each alternative.

MODIFYING FACTORS

State Acceptance -- Indicates whether community concerns are addressed by the remedy and whether the community has a preference for a remedy. Public comment is an important part of the final decision.

Community Acceptance--Indicates whether community concerns are addressed by the remedy and whether the community has a preference for a remedy. Public comment is an important part of the final decision.

A comparative analysis was conducted to evaluate the relative performance of each of the five alternatives for lead- and chromium-contaminated soils and for TCE-contaminated soils in relation to each of nine specific evaluation criteria. The comparative summary us represented in tabular form in Table 8-1. The advantages and disadvantages of the alternatives are compared in the following paragraphs. A Complete, detailed evaluation is presented in the Soils FS (ESE, 1994a).

8.1 LEAD- AND CHROMIUM-CONATMINATED SOILS

The alternatives for lead- and chromium-contaminated soils include:

1. Alternative 1C--Containment: Asphalt Cap;
2. Alternative 2A--Treatment: Physical/Chemical-- Fixation/Solidification;
3. Alternative 2B--Chemical Extraction/Soil Washing;
4. Alternative 4B--Removal and Disposal: Offsite Landfill; and
5. Alternative 5A--No Action: Limit Access/Use Restrictions.

8.1.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternative 2A (Fixation/Solidification), Alternative 2B (Chemical Extraction/Soil Washing), and alternative 4B (Offiste Disposal) were all judged to be equivalent with respect to protecting human health and the environment:

1. Alternative 2A (Fixation/Solidification) physically fixated lead and chromium in a monolithic structure that will prevent leaching of the metals. After the soil has been solidified, it is covered with an asphalt cap to remove the exposure pathway to environmental receptors.

2. Alternative 2B (Chemical Extraction/Soil Washing) chemically removes lead and chromium from the site soils. The treatment residuals are transported offsite to an appropriately permitted waste management facility.

3. Alternative 4B (Offsite Disposal) removes all soils with lead and chromium in excess of cleanup standards from the site, thus preventing exposure to soils that could cause adverse health effects.

Table 8-1. Summary of Detailed Analysis of Remaining Alternatives for Lead-, Chromum-, and TCE-Contaminated Soils (Page 1 of 3)

	SHORT-TERM EFFECTIVENESS (a)				LONG-TERM EFFECTIVENESS		
ALTERNATIVE	Protection of Community During Remediation	Protection of Workers During Remediation	Environmental Impacts	Time to achieve Remedial Response Objective	Magnitude of Remaining Risk	Adequacy of Controls	Reliability of Controls
LEAD- AND CHROMIUM-CONTAMINATED SOILS							
IC-Contaminant (Asphalt Cap)	3	3	2	60 days	2	3	3
2A-Treatment (Fixation/Solidification)	3	3	3	240 days	2	2	3
2B-Innovative Technologies (Chem Ext./Soil Washing)	3	3	3	240 days	1	2	3
4B-Removal and Disposal (Offsite Landfill Disposal)	3	3	3	120 days	3	3	3
5A-No Action (Limit Access)	1	1	1	0 days	1	1	1
TCE-CONTAMINATED SOILS							
2B-Onsite Incineration	3	3	3	900 days	3	3	3
2C-Treatment Technologies (In-Situ Volatilization)	3	3	3	730 days	3	3	3
3A-Innovative Technologies (Low Temp. Thermal Stripping)	3	3	3	476 days	3	3	3
4A-Removal and Disposal (Offsite Landfill Disposal)	3	3	3	240 days	3	3	3
5A-No Action (Limit Access)	1	1	1	0 days	1	1	3

3 = Alternative meets all requirement of this criterion
2 = Alternative may not be capable of meeting all requirements of this criterion.
1 = Alternative does not meet requirements of this criterion.
(a) = Only includes time following initiation of construction/installation. Does not include time contractor procurement.

Source: ESE

Table 8-1. Summary of Detailed Analysis of Remaining Alternatives for Lead-, Chromium-, and TCE-Contaminated Soils (Page 2 of 3)

		REDUCTION OF TOXICITY, MOBILITY, AND VOLUME				IMPLEMENTABILITY		
ALTERNATIVE	Treatment Process and Remedy	Amount of Hazardous Materials Destroyed or Treated	Reduction in MTV	Irreversibility of Treatment	Type and Quantity of Treatment Residual	Technical Feasibility	Administrative Feasibility	Availability of Services and Materials
LEAD- AND CHROMIUM-CONTAMINATED SOILS								
IC-Contaminant (Asphalt Cap)	3	1	2	1	1	3	3	3
2A-Treatment (Fixation/Solidification)	3	3	2	3	3	2	3	3
2B-Innovative Technologies (Chem Ext./Soil Washing)	3	3	2	3	3	3	3	3
4B-Removal and Disposal (Offsite Landfill Disposal)	3	1	3	3	3	3	3	3
5A-No Action (Limit Access)	1	1	1	1	1	3	3	3
TCE-CONTAMINATED SOILS								
2B-Onsite Incineration	3	3	3	3	3	3	1	2
2C-Treatment Technologies (In-Situ Volatilization)	3	3	3	3	3	3	3	3
3A-Innovative Technologies (Low Temp. Thermal Stripping)	3	3	3	3	3	3	3	2
4A-Removal and Disposal (Offsite Landfill Disposal)	3	1	3	3	3	3	3	3
5A-No Action (Limit Access)	1	1	1	1	1	3	1	1

3 = Alternative meets all requirement of this criterion
2 = Alternative may not be capable of meeting all requirements of this criterion.
1 = Alternative does not meet requirements of this criterion.

Source: ESE

Table 8-1. Summary of Detailed Analysis of Remaining Alternatives for Lead-, Chromium-, and TCE-Contaminated Soils (Page 3 of 3)

	COSTS (b)					COMPLIANCE WITH ARARS						
ALTERNATIVE	Capital Costs ($1,000)	Annual O & M Costs ($1,000)	Accuracy of Cost Estimates	Present Worth Cost ($1,000)	Overall Costs	Contaminant-Specific ARARS	Action-Specific ARARS	Location-Specific ARARS	Other Criteria, Advisories, and Guidance	Overall Protection of Human Health and the Environment	State Acceptance	Community Acceptance
LEAD- AND CHROMIUM-CONTAMINATED SOILS												
IC-Contaminant (Asphalt Cap)	280	4	3	388	3	N/A	3	N/A	3	2	1	NCR
2A-Treatment (Fixation/Solidification)	808	4	1	1,015	2	N/A	3	N/A	3	3	3	NCR
2B-Innovative Technologies (Chem Ext./Soil Washing)	1,425	N/A	1	1,773	1	N/A	3	N/A	3	3	3	NCR
4B-Removal and Disposal (Offsite Landfill Disposal)	221	N/A	3	683	3	N/A	3	N/A	3	3	2	NCR
5A-No Action (Limit Access)	52	N/A	3	52	3	N/A	3	N/A	3	1	1	NCR
TCE-CONTAMINATED SOILS												
2B-Onsite Incineration	137,000	N/A	2	137,000	1	N/A	3	N/A	3	3	2	NCR
2C-Treatment Technologies (In-Situ Volatilization)	286	130	3	528	3	N/A	3	N/A	3	3	3	NCR
3A-Innovative Technologies (Low Temp. Thermal Stripping)	6,800	N/A	3	6,800	1	N/A	3	N/A	3	3	3	NCR
4A-Removal and Disposal (Offsite Landfill Disposal)	23,000	N/A	3	23,000	1	N/A	3	N/A	3	3	2	NCR
5A-No Action (Limit Access)	N/A	260	3	260	3	N/A	3	N/A	3	1	1	NCR

3 = Alternative meets all requirement of this criterion
2 = Alternative may not be capable of meeting all requirements of this criterion.
1 = Alternative does not meet requirements of this criterion.
NCR = No Comments Received (to be updated after review of public comments).
(b) = Based on a discount rate of 5 percent and a 20-year period.

Source: ESE

Alternative 1 C (Asphalt Cap) was judged to be less effective in the protection of human health and the environment than alternatives 2A (Fixation/ Solidification), 2B (Chemical Extraction/Soil Washing), and 4B (Offsite Disposal) in that soils with lead and chromium exceeding cleanup standards would still remain at the site in an unaltered matrix. Although this alternative does remove an exposure pathway, the fact that soils are left onsite in concentrations exceeding cleanup standards makes this alternative less desirable with respect to protection of human health and the environment.

Alternative 5A (No Action) is not protective of human health and the environment in that onsite workers would continue to be exposed to soils that exceed cleanup standards.

8.1.2 COMPLIANCE WITH ARARS

Alternatives 1C (Asphalt Cap), 2A (Fixation /Solidification), 2B (Chemical Extraction/Soil Washing), and 4B (Offsite Disposal) are all equally capable of compliance with ARARs.

Alternative 5A (No Action) will not comply with ARARs.

8.1.3 LONG-TERM EFFECTIVENESS

Alternative 4B (Offsite Disposal) was determined to be the best alternative with respect to long-term effectiveness. With the removal of 0 soils in excess of cleanup standards, no health threats would remain onsite. The implementation of Alternative 4B (Offsite Disposal) could be completed with reliable and adequate controls.

Alternative 2B (Chemical Extraction/Soil Washing) was judged to be slightly less effective that Alternative Q (Offsite Disposal). Although the magnitude of remaining risk would be equivalent to that described in Alternative 4B (Offsite Disposal) (i.e., all soils in excess of cleanup standards would be removed from the site), the reliability of the alternative is questionable. Soil Washing /Chemical Extraction is an innovative technology for which substantial experience with implementation does not exist. Therefore, there is insufficient information to judge how well the process will perform.

Alternative 2A (Fixation/Solidification) was considered to be slightly less effective than Alternatives 4B (Offsite Disposal) and 2B (Chemical Extraction/Soil Washing). Although solidification/ stabilization is a proven technology to remediate contaminated soils, and success of treatment can be documented in the short-term, there are unknown factors associated with the long-term stability of the monolith containing lead- and chromium -contaminated soils.

Alternative 1C (Asphalt Cap) was considered to be less effective than the above alternatives. A limited life is associated with the installation of an asphalt cap. The reliability to which the cap will be maintained and replaced in the future makes this alternative less effective than the other previously described.

Alternative 5A (No Action) is the no-action alternative and does not address the appropriate long-term related issues related to protection of adult workers onsite.

9.1.4 REDUCTION OF TMV THROUGH TREATMENT

Alternative 2B (Chemical Extraction/Soil Washing) was rated the highest with respect to reduction of TMV through treatment. It treats all soils with lead and chromium in excess of cleanup standards, reduces the toxicity of the soils through chemical extraction of lead and chromium, and eliminates the potential of lead and chromium mobility from soils. The process is irreversible and yields a residual that can be easily managed offsite. However, this technology

has not been field tested at SHARPE. The ability of the process to reduce TMV is not known.

Alternative 2A (Fixation/Solidification) was considered to be slightly less effective than 2B (Chemical Extraction/Soil Washing) with respect to reduction of TMV through treatment. Although the mobility of lead and chromium would be addressed with this alternative, lead- and chromium-contaminated soils would remain onsite in the form of a monolith; there is an estimated 25-percent volume increase associated with treatment of soils. All other evaluation factors for this criteria were considered equivalent with Alternative 2B (Chemical Extraction/Soil Washing).

Alternative 4B (Offsite Disposal) was considered to be slightly less effective than 2A (Fixation/Solidification) with respect to reduction of TMV through treatment, solely due to the fact that no soils will be treated or destroyed with this alternative. Soils contaminated with lead and chromium in excess of cleanup standards would simply be transported to an appropriately permitted offsite disposal facility, All other evaluation factors for this criteria were considered equivalent with Alternative 2A (Fixation/ Solidification).

Alternative 1C (Asphalt Cap) was considered to be less effective than the above alternatives because the lead- and chromium -contaminated soils in excess of cleanup standards would remain in place. Although this alternative would reduce mobility through capping, the toxicity and volume of the soils would remain unchanged. Also, an asphalt cap is not considered a permanent structure, and there are concerns with respect to irreversibility of treatment with this alternative. No treatment is employed with this alternative.

Alternative 5A (No Action) does not reduce the toxicity, mobility, or volume of lead-and chromium-contaminated soils through treatment at SHARPE.

8.1.5 SHORT-TERM EFFECTIVENESS

Alternatives 2A (Fixation/Solidification), 2B (Chemical Extraction/Soil Washing), and 4B (Offsite Disposal) were all judged to be equivalent with respect to short-term effectiveness. All three alternatives protect the community and workers onsite. No adverse environmental impacts are expected with the implementation of these three alternatives. The time to implement Alternatives 2A (Fixation/Solidification), 2B (Chemical Extraction/Soil Washing), and 4B (Offsite Disposal) are considered comparable at 240 days, 240 days, and 120 days, respectively.

Alternative 1C (Asphalt Cap) was considered to be less effective that the previously described alternatives in that lead- and chromium-contaminated soils in excess of cleanup standards would remain onsite.

Alternative 5A (No Action) was not considered to adequately address short term effectiveness because onsite workers would continue to be exposed to lead- and chromium-contaminated soils in excess of cleanup standards.

8.1.6 IMPLEMENTABILITY

Alternatives 1C (Asphalt Cap) and 4B (Offsite Disposal) were considered to be the most implementable alternatives evaluated with respect to technical feasibility, administrative feasibility, and availability of services and materials. Alternatives 2A (Fixation/Solidification) and 2B (Chemical Extraction/Soil Washing) were considered less implementable due to the lack of pilot testing data which would confirm that the technology is technically feasible.

As Alternative 5A (No Action) does not involve remediation; however, implementability of this alternative is not a concern, as the only construction required would be installation of a

fence.

8.1.7 COSTS

Capital, O&M, and present-worth costs for Alternatives 1C (Asphalt Cap), 2A (Fixation/ Solidification), 2B (Chemical Extraction/Soil Washing), 4B (Offsite Disposal), and 5A (No Action) are presented in Table 9-1.

The present-worth cost is the least expensive for the no-action alternative. The least expensive action alternative is Alternative 1C (Asphalt Cap); Alternative 2A (Fixation /Solidification) has a much higher capital cost than 4B (Offsite Disposal). The costs for Alternative 2B (Chemical Extraction/Soil Washing) are significantly higher than the estimated costs for the other action alternatives.

8.1.8 STATE ACCEPTANCE

Alternative 2A (Fixation /Solidification) and 2B (Chemical Extraction/Soil Washing) were considered the most acceptable to the state, as they employed treatment as a principal element of reducing TMV. Alternative 4B (Offsite Disposal) involves excavation followed by removal and disposal. This alternative is considered acceptable to the state, but is not as favorable as treatment remedies.

Alternative 1C (Asphalt Cap) is not acceptable to the state as it does not provide a permanent solution. Alternative 5A (No Action) is not acceptable to the state as it does not protect human health and the environment.

8.1.9 COMMUNITY ACCEPTANCE

Based on the public review and comment on the Proposed Plan, the community has no significant concerns regarding selection and/or implementation of any of the alternatives investigated by SHARPE to remediate contaminated soils.

8.2 TCE-CONTAMINATED SOILS

The alternatives for TCE-contaminated soils include:

1. Alternative 2B--Thermal Treatment: Onsite Incineration,
2. Alternative 2C--Treatment Technologies: In-Situ Volatilization (ISV),
3. Alternative 3A--Innovative Technologies: Low-Temperature Thermal Stripping (LTTS),
4. Alternative 4A--Removal and Disposal: Offsite Landfill, and
5. Alternative 5A--No Action: Limit Access/Use Restrictions

8.2.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The levels of TCE in soils do not exceed the EPA-recommended 10-4 to 10-6 risk range, so there is not a specific concern with worker exposure to these soils. However, remediation of TCE-contaminated soils will expedite and enhance the cost-effectiveness of the groundwater remediation effort being conducted in accordance with the June 1993 OU1 ROD.

Alternative 2B (Onsite Incineration), 2C (ISV), 3A (LTTS), and 4A (Offsite Disposal) were all judged to be equivalent with respect to protection of human health and the environment:

1. Alternative 2B (Onsite Incineration) would incinerate soils contaminated with TCE. Proper management of incinerator emissions would prevent adverse affects on the population potentially affected by the implementation of this alternative.

2. Alternative 2C (ISV) would remove TCE from contaminated soils using the process of in-situ volatilization. Using carbon adsorption to treat offgases from the process would protect the population potentially exposed to ISV emission.

3. Alternative 3A (LTTS) would remove TCE from contaminated soils using the process of low temperature thermal stripping. Using carbon adsorption to treat offgases from the process would protect the population potentially exposed to LTTS emissions.

4. Alternative 4A (Offsite Disposal) would remove TCE-contaminated soils from the site and transport them to an offsite disposal facility.

The above alternatives are all considered to be protective of human health and the environment.

Alternative 5A (No Action) is judged to be less effective in the protection of human health and the environment in that TCE-contaminated soils would be allowed to remain onsite and function as a continuing source of groundwater contamination. However, when considering the scope of the groundwater treatment action currently underway at SHARPE, Alternative 5A (No Action) is considered protective of human health and the environment.

8.2.2 COMPLIANCE WITH ARARS

Alternatives 2B (Onsite Incineration), 2C (ISV), 3A (1-LTTS), and 4A (Offsite Disposal) are equally capable of achieving all ARARs. No ARARs were identified for Alternative 5A (No Action).

8.2.3 LONG-TERM EFFECTIVENESS

Alternatives 2B (Onsite Incineration), 2C (ISV), 3A (LTTS), and 4A (Offsite Disposal) were all judged to be equally effective with respect to long-term effectiveness of remediation. All technologies used in these four alternatives, are proven for soils contaminated with VOCs. As TCE-contaminated soils do not represent a health threat, implementation of the four alternatives is expected to result in acceptable residual risks onsite. Once the remedial action is completed, effectiveness of the treatment at the completion of the action is not expected to decrease over time. Alternative 2B (Onsite Incineration) does not yield any residuals that require offsite management. Alternatives 2C (ISV), 3A (LTTS), and 4A (Offsite Disposal) yield residuals, which must be managed offsite at appropriately permitted waste management facilities.

As Alternative 5A (No Action) does not result in implementation of an alternative, there are no long-term effectiveness parameters to address.

8.2.4 REDUCTION OF MTV THROUGH TREATMENT

Alternatives 2B (Onsite Incineration), 2C (ISV), and 3A (LTTS) were all considered to be equally effective in reduction of MTV through treatment for TCE-contaminated soils. All three technologies employ treatment of TCE. However, Alternative 2B (Onsite Incineration) does employ a technology that destroys TCE. With alternatives 2C (ISV) and 3A (LTTS), TCE is transferred from the soils to activated carbon (for emission controls). TCE adsorbed on carbon will eventually be transferred offsite for reactivation, which involves destruction of TCE.

Alternative 4A (Offsite Disposal) does not involve treatment. Therefore, no TCE is treated or destroyed with this alternative. The TCE-contaminated soils are simply transferred offsite to an appropriately permitted disposal facility.

Alternative 5A (No Action) does not involve remedial action; no reduction of MTV through treatment is associated with this alternative.

9.2.5 SHORT-TERM EFFECTIVENESS

Alternatives 2B (Onsite Incineration), 2C (ISV), 3A (LTTS), 4A (Offsite Disposal), and 5A (No-Action) were all considered to be equally effective with respect to protection of the community and onsite workers through implementation prudent safety precautions. However, the time to achieve remedial response objectives vary. Alternative 5A can be implemented immediately. Estimated time to completion of Alternative 4A (Offs1te Disposal) is 240 days, followed by Alternatives 3A (LTTS), 2C (ISV), and 2B (Onsite Incineration) at 476, 730, and 900 days, respectively.

8.2.6 IMPLEMENTABILITY

Alternatives 2C (ISV) and 4A (Offsite Disposal) were considered to be the most implementable alternatives evaluated with respect to technical feasibility, administrative feasibility, and availability of services and materials. Alternatives 3A (LTTS) was considered slightly less implementable due to the fact that the process is patented and there are a limited number of LTTS systems available at any given time. Alternative 2B (Onsite Incineration) was considered to be the least implementable alternative due to complications associated with permitting incinerators, although SHARPE need only comply with the substantive requirements of a permit.

Implementation of Alternative 5A (No Action), which includes groundwater monitoring, is not expected to be difficult.

8.2.7 COSTS

Capital, O&M, and present-worth costs for Alternatives 2B (Onsite Incineration), 2C (ISV), 3A (LTTS), 4A (Offsite Disposal), and 5A (No Action) are presented in Table 8-1.

The present-worth cost is the least expensive for the no-action alternative. The least expensive action alternative is Alternative 2C (ISV); Alternative 4A (Offsite Disposal) has a much higher capital cost than Alternative 3A (LTTS). The capital costs for Alternative 2B (Onsite Incineration) are significantly higher than the estimated costs for the other treatment alternatives.

8.2.8 STATE ACCEPTANCE

Alternatives 2C (ISV) and 3A (LTTS) were considered equally acceptable to the state as they utilize treatment as a principal element of remediation. Alternative 2B (Onsite Incineration), although employing treatment, was considered less acceptable due to the potential of the process yielding mobile metals in ash that could eventually leach to groundwater. Alternative 4A (Offsite Disposal) involves excavation followed by removal and disposal. This alternative is considered acceptable to the state, but is not as favorable as treatment remedies.

Alternative 5A (No Action) is not acceptable to the state as it does not protect human health and the environment.

8.2.9 COMMUNITY ACCEPTANCE

Based an the public review and comment on the Proposed Plan, the community has no significant concerns regarding selection and/or implementation of any of the alternatives investigated by SHARPE to remediate contaminated soils.

9.0 THE SELECTED REMEDIES

Based on the requirements of CERCLA, information obtained during the RI (ESE, 1990) and FS (ESE, 1994b), detailed analysis of alternatives, and public comments, SHARPE, EPA, DTSC, and CVRWQCB have determined that:

1. Alternative 4B (Removal and Disposal to Offsite Landfill) is the most appropriate remedy for lead- and chromium-contaminated sds to protect human health and the environment from exposure to these soils;

2. Alternative 2C (ISV) is the most appropriate source-control remedy for TCE-contaminated soils given the groundwater rernediation effort currently being operated at SHARPE; and

3. NFA is appropriate for 111 SWMUs.

The following sections describe the major components of each of the selected alternatives. Engineering variables presented in the following sections, however, are subject to change during the remedial design phase of work, which is to be implemented following signature of the ROD by SHARPE, EPA, DTSC, and CVRWQCB. Such changes, in general, reflect modifications resulting from the engineering design process.

9.1 LEAD- AND CHROMIUM-CONTAMINATED SOILS

Removal and Disposal: Offsite Landfill

The objective of the remedy is to excavate lead- and chromium-contaminated soils from those areas defined in Fig. 2-1 such that the soil concentrations do not present a threat to human health and the environment. Major components of this alternative include:

1. Characterization of locations with levels of lead and chromium exceeding or potentially exceeding cleanup standards;

2. Clearing of areas where excavation is required;

3. Excavation of soils which exceed cleanup standards for lead and chromium, followed by disposal at an appropriately permitted offsite disposal facility;

4. Collection of verification samples from the floor and walls of the excavation to ensure that all soils exceeding cleanup standards for lead and chromium have been removed;

5. Backfill and compaction of fill in excavation to return excavation sites to natural grade;

6. Characterization of dissolved lead and chromium in excavations;

7. Perform a statistical analysis of lead and chromium in groundwater, to determine if groundwater has been impacted at levels in excess of MCLs; and

8. Institute a groundwater monitoring plan.

Based on conclusions presented in the Soils RA report, several areas of concern exist at SHARPE.

9.1.1 FURTHER CHARACTERIZATION

The initial phases of remedial action involve characterization of sites determined to exceed or potentially exceed cleanup standards. Prior characterization in the North and South Balloon Area has been accomplished using XRF methods. These methods were considered reliable for samples collected in the North Balloon Area. However, data collected in the South Balloon Area showed poor correlation between laboratory and field methods. For this reason, it is appropriate to re-characterize the South BaBoon Area, at specific locations, for lead and chromium. Sites recommended for further chromium characterization in the 0 to 2-ft interval are (see sample grid on Fig. 5-12):

9G
20S-3G
50N+50E-1F
S29-B4
S29-B6
S29-B9
S29-Bll
S29-B12
48E-1F
50E-1H

Sites recommended for further lead characterization in the 0- to 2-ft interval are (see sample grid on Fig. 5-12):

9E
50E-1H
50E-1G
S29-B9
9G

9.1.2 CLEANUP STANDARDS

The cleanup standard for lead-contaminated soils in the North and South Balloon Areas has been established as 1,000 mg/kg. The soil cleanup level of 1,000 mg/kg has been confirmed as protective of an industrial adult worker based on results from the DTSC's Lead Spreadsheet Model default exposure scenarios. This cleanup level is also inclusive of the range of 500 mg/kg to 1,000 mg/kg, which EPA recommends as an interim cleanup level based on EPA's biokinetic uptake model (EPA, 1991 a). Although a cleanup value of 1,000 mg/kg may not be protective of a residential child, such a receptor exposure is currently not applicable nor anticipated at the site. If the land use and site activities at SHARPE are altered in the future to include residential housing and child exposure scenarios, then a reevaluation of the risk assessment will be warranted in accordance with DOD base closure policy (Title U.S.C. 2687 and NOTE). Results from a revised risk assessment, based on changing receptors, may necessitate implementation of additional remedial actions.

EPA has not established an interim cleanup level for chromium at Superfund sites. The most sensitive health-based toxicity endpoint identified in the current literature for chromium is contact dermatitis. The dermatitis toxicity value for trivalent chromium is calculated to be 500 mg/kg. This value of 500 mg/kg accounts for both sensitization and elicitation of the dermatitis reaction and is protective of greater than 90 percent of the population. It is not protective of the 10 percent of the population considered hypersensitive. This may not be a conservative cleanup value, since all the chromium is assumed to be in trivalent form. The cleanup standard for chromium was established as 300 mg/kg, at the request of CVRWQCB. The Board considered this level more protective of groundwater than the 500 mg/kg level previously referenced.

There are several areas where lead- and chromium-contaminated soils above cleanup standards exist in the same location. When considering this, the total volume of soils requiring remedial action is estimated at 2,825 yd3 (2,085 yd3 in the South Balloon Area and 740 yd3 in the North Balloon Area). The total area represented by this volume, which should be considered in estimating the area and volume of soils to be remediated, is 68,050 ft2 (28,150 ft2 in the South Balloon Area and 39,900 ft2 in the North Balloon Area).

9.1.3 EXCAVATION AND REMOVAL ACTIVITIES

After areas of contamination in excess of clump standards have been confirmed, site preparation will be completed. This includes removal of light brush and any existing pavement or concrete using a front-end loader. Uncontaminated debris would then be loaded into covered trucks and transported to an appropriately permitted construction landfill.

Contaminated soils would be excavated from each area using a hydraulic backhoe or similar equipment. The maximum depth of excavation would be 2 ft, which represents a depth by which humans could be expected to come into contact with soils. The surface area of the working face would be kept as small as possible to minimize the release of fugitive dust emissions. Contaminated soils would be loaded onto 20-yd3 dump trucks. Transportation of all soils would be completed in a manner that complies with all federal, state, and local laws.

Following removal of soils with lead and chromium concentrations in excess of cleanup standards, confirmation sampling will be conducted in the excavation (wall and floor samples) to ensure that all soils exceeding cleanup standards have been removed. The specific details of the confirmation sampling plan will be provided as part of the remedial design (RD).

Testing would be conducted to determine if any soils were hazardous by characteristic. If soils were determined to be hazardous by characteristic, the excavated soils would be disposed of in a Class I facility. One such facility exists in Kettleman, CA. If soils were determined to be non-hazardous, they would be disposed of at a Class II facility. One such facility exists in Stockton, CA. It was estimated that completion of this remedial alternative would require approximately 120 working days.

Approximately 2,825 yd3 of additional soil would be needed to complete backfilling and to return the affected area to existing grade. This additional soil may be available from sites at SHARPE and/or from offsite locations. Backfill material may be placed in 1-ft lifts (or less) and compacted to achieve 95 percent of the Modified Procter Test Method. Density testing on every other lift would be performed to verify the effectiveness of compaction efforts. Locations of soils to be excavated in the North and South Balloon Areas are presented in Fig. 2-1.

9.1.4 EVALUATION OF RESIDUAL CONCENTRATIONS AND EVALUATION OF GROUNDWATER

SHARPE will evaluate the impact or threat of impact to ground water from the residual lead and chromium in the vadose zone using an appropriate methodology.

SHARPE has agreed to undertake the following tasks for soils:

1) Perform sampling, using DI WET, to evaluate the levels of soluble metals left in place.

2) If the DI WET analysis reports samples with lead greater than 150 ug/l and/or chromium greater than 50 ug/l, then SHARPE will perform an attenuation study. SHARPE will develop an appropriate methodology to characterize the degree of attenuation provided by the underlying soils to retard the movement of remaining lead and chromium in the vadose zone in the excavation areas. This methodology may include fate and transport analysis of metals, collection of soil lithology to characterize the geology in the immediate vicinity, completion of soil testing analysis to characterize soil ability to retard metals, and analysis of deeper soils for chromium and lead.

If the Soils Attenuation Study shows that the residual soils concentrations threaten to impact water quality above MCLs, than SHARPE, USEPA, DTSC, and the RWQCB will determine the need for any additional characterization or remedial actions and modify this ROD, if necessary.

SHARPE has agreed to undertake the following task for ground water:

> Complete a Ground Water Statistical Analysis to be included as part of the Annual Ground Water Monitoring Report to determine if ground water has been statistically impacted at levels above background or above MCLS. The Ground Water Monitoring Plan will specify the frequency, location, and duration of metals analysis.

If an Annual Ground Water Statistical Analysis identifies a statistically significant impact to water quality above the conditions that exist at the time of signature of this ROD, then SHARPE, USEPA, DTSC, and RWQCB will determine the need for any additional action (may include continued monitoring, ground water data trend analysis, soil sampling, or additional remedial actions) and modify this ROD, if necessary.

9.2 VOC-CONTAMINATED SOILS

Alternative 2C-Treatment Technologies in-Situ Volatilization

The ISV alternative involves using a ISV to induce air flow from the subsurface soils to a vapor extraction point. The air from the subsurface is removed via the vapor extraction point by an air blower, thus creating a negative pressure or vacuum in the subsurface soils. The airflow and vacuum condition in the subsurface soils induces contaminants to volatize from the adsorbed phase to the vapor phase. The ISV offgases are then removed via the vapor extraction point, and activated vapor-phase carbon will be used to remove the TCE from the ISV offgases; prior to discharge to the atmosphere. Soil gas monitoring wells, independent of ISV wells, will be installed to monitor progress of remediation.

The two components of this alternative are:

1. Remediation of seven sites that have been sufficiently characterized and found to be degrading groundwater (see five blue-shaded sites and two black-shaded sites in Fig. 2-1);

2. Characterization of seven sites that are potentially degrading groundwater (see green shaded areas in Fig. 2-1). 7bese sites are subject to remediation based on the results of the characterization.

9.2.1 ISV OPERATION

Sharpe will remediate VOC contamination in the soil as a source control effort to prevent further degradation of the ground water and minimize the aquifer cleanup time. SHARPE will evaluate ISV remediation effectiveness by tracking the cumulative mass of VOCs removed and modeling to assess the affects of remaining VOCs on ground water. Additionally, soil gas monitoring will be conducted in order to obtain the soil gas concentration data necessary to run the models referenced in section 9.2.2. and 9.2.3. ISV remediation will continue until asymptotic conditions have been reached.

Sharpe will plot the mass of VOCs removed as a function of time to help determine how quickly the cumulative mass removed approaches asymptotic levels. It is expected that the graph of cumulative mass removed versus time will follow the general curve defined by the following exponential decay equation:

$$Mt = Sum(Mi) = KT [1-exp(-t/T)] \quad \text{Equation 1}$$

Where: t = time
Mt = total cumulative mass removed at time t
Mi = total mass removed from each vapor extraction well
KT = that maximum cumulative total mass which the ISV system approaches asymptotically,
T = Tao, the time constant, or resident time = amount of time at which the ISV system removes approximately 63% of KT (theoretically, T is equivalent to V/Q, or the volume of soil gas in the zone being remediated (V) divided by the volumetric flow rate of the ISV system (Q))

Equation 1 above will be used as a guide for using field data to determine when asymptotic conditions have been met. Where the "asymptote" to the mass removal curve is that total/cumulative maximum mass (KT - defined above) which the ISV system attempts to remove but approaches with ever decreasing speed asymptotic conditions will have been reached when the upper limb or this curve is substantially linear and the slope of the curve approaches zero. The specific procedures used to evaluate if data are asymptotic will be defined during the remedial design phase of work. However, it is not expected that field data will match the theoretical

equation exactly, thus, based on field data it will be necessary to use best professional judgement to conclude that asymptotic conditions have been reached.

In order to assess if there are zones where the ISV system has not removed VOCs "rebound periods" will be used to allow residual vadose zone contamination to re-equilibrate. The treatment system will be shut down temporarily for a suitable period of time after an asymptotic (mass removed) curve is produced. This will allow for VOC concentrations to re-establish in the soil gas. After the temporary shutdown period, soil gas monitoring points will be sampled to determine the remaining VOC concentrations in the soil gas. If the resulting VOC levels are not characteristic of the previous conditions, or indicate a "spike" increase in soil gas concentration, then additional treatment may be wan-anted.

9.2.2 VOC CONTAMINATED SOIL CLEANUP STANDARD

VOC contaminated soils cleanup, for each remediation area, shall:

(a) be protective of human health and the environment; and

(b) cause or threaten to cause concentrations in the ground water to exceed the aquifer cleanup levels.

VLEACH or another appropriate vadose zone model will be used to assess the effects of VOC contaminated soils to a 10 foot deep zone of ground water underneath the source area. For the SHARPE site, the Parties have agreed that a TCE soil gas concentration at or below 350 ppbv will be considered to satisfy the above standard without modeling.

For those VOC sources in the vadose zone overlying ground water that is not currently in excess of the aquifer cleanup levels (e.g, the black shaded area in the upper left comer of Figure 2. 1) Sharpe has proposed VOC soil remediation so that existing VOC concentrations in the underlying groundwater will not increase.

SHARPE will design, construct, operate, and, if necessary, modify the ISV systems to comply with this cleanup standard. If at some later date it is determined that it is infeasible to achieve the VOC contaminated soils cleanup standard specified above, this issue will be reevaluated by SHARPE, USEPA, DTSC, and the CVRWQCB.

9.2.3 TECHNICAL AND ECONOMIC FEASIBILITY

Even if the cleanup standard in Section 9.2.2 is met, SHARPE has agreed that VOCs in the vadose zone will be remediated to the extent technically and economically feasible. The feasibility analysis will include but not be limited to consideration of the following factors:

1) Technical effectiveness of the system, including whether the asymptote as described in 9.2.1 has been reached;

2) A ground water transport model may be used to predict the time the pump and treat remedy would need to operate, with no additional vadose zone remediation, to achieve aquifer cleanup levels;

3) The additional cost for continuing to operate the ISV system to/at asymptotic mass levels;

4) The total cost for enhancing the ISV technology (e.g., additional vapor extraction wells, air injection) beyond system optimization, which should occur throughout operation of the remedial action, to remove additional VOCS;

5) The cost of vadose zone remediation compared to the cost of ground water remediation when comparing cost on the basis of a common unit (i.e., cost per pound of TCE removed) prior to the time that ground water reaches aquifer cleanup levels.

SHARPE will provide the information specified in sections 9.2.1, 2, and 3 to the regulatory agencies for review and approval prior to formal shutdown of the ISV systems. Additionally, quarterly performance reports of operating ISV systems will be provided to regulatory agencies for review and comment until ISV activities are terminated.

9.2.4 FURTHER CHARACTERIZATION

As described in Section 9.2, characterization is required at seven areas green shaded areas in Figure 2-1. Soil gas samples for VOC analysis will be collected for lateral and vertical characterization of the extent of VOC contamination in the vadose zone.

This information will be used to determine if these areas of concern are in compliance with the ISV cleanup standard. If not, the ISV system will be installed and optimized as described above. If the data collected as part of the characterization indicates that TCE soil gas concentrations are less than 350 ppbv, then no action will be taken.

Even if the VOC contamination in these areas is below the ISV cleanup standard, SHARPE may proceed with remedial action as described above when it is cost effective and when site specific characteristics (e.g., lithology) indicate that the ISV treatment would be practical.

The following factors will be used in the cost-effectiveness analysis:

1) The additional cost for extending the groundwater pump and treat remedy, but with no additional soils remediation, in order to attain drinking water standards in the aquifers;

2) The total cost for implementing the ISV system to asymptotic mass levels;

3) The cost of vadose zone remediation compared to the cost of ground water remediation when comparing cost on the basis of a common unit (i.e., cost per pound of TCE removed) prior to the time that ground water reaches aquifer cleanup levels.

This information will be presented to the regulatory agencies for review and approval prior to close-out of these areas of concern.

9.3 NO FURTHER ACTION SITES

During the course of the CERCLA investigations, SHARPE recommended that many sites be considered NFA sites. A no further action determination is appropriate in the following situations: when an area is already in a protective state (i.e., an area poses no current or potential threats to human health or the environment); or when CERCLA does not provide the appropriate legal authority to undertake a remedial action. The 1994 Soils FS documented all sites that SHARPE considers to require NFA along with the rationale supporting why the NFA would be appropriate. EPA, DTSC, and CVRWQCB have reviewed this information and agree that a total of 111 SWMUs fall into the category of NFA. These sites are presented in Table 9-1, along with the reasoning as to why each site is considered an NFA site.

SWMUs were originally identified as part of the RI. Each SWMU was evaluated for its past operation and potential for generating wastes. Those SWMUs for which no documented releases were reported, or those for which during the normal operation would not be suspected of causing releases of wastes to the environment, were not evaluated further and were considered to require

no further action. Those sites suspected of being areas where wastes were released were evaluated as part of the later stages of the RI. Data from these investigations was incorporated into the RA. Sites with COCs less than health-based cleanup standards were recommended for NFA. The maximum concentrations of chemical detected at the NFA sites do not pose risks to human health and the environment. Therefore, no remedial actions are necessary to ensure protection of human health and the environment (CERCIA §121). Because no remedial actions are necessary, no statutory determmations or remedial actions are necessary.

10.0 STATUTORY DETERMINATIONS

A total of 111 SWMUs were determined not to pose potential risks to human health and the environment. Tberefore, no remedial actions am necessary to ensure protection of human health and the environment.

Because no remedial actions are necessary, no statutory determination of remedial actions are necessary for the 111 SWMUs.

Table 9-1. No Further Action Sites (Page 1 of 7)

Site/SWMU Number	Description	Comments
S2	Pest control, Equipment Storage	Building used only for equipment storage; no use of hazardous materials at this site
PS1	Pest control shop	No sampling planned; all pesticide mixing completed in building; no outside storage of hazardous materials, no releases reported
A10	Railroad Car Maintenance	Sampling performed per work plan; no contamination found; non-fuel UST (9,11) being remediated by SHARPE
A14	Vehicle Maintenance Shop	Sampling performed per work plan; no contamination found; fuel UST (15) being remediated under SHARPE contract
S5	Spray paint booths	Sampling performed with sewerline investigation; surrounding area Paved; wastes to IWTP
A16	Battery Shop; Vehicle Maintenance	Sampling performed with sewerline investigation; surrounding area paved; wastes to IWTP; non-fuel UST 20 removed (no remediation required)
A31	Vehicle Maintenance	Samples taken per work plan - 2 borings; no contamination found
S38	Buried boxcar of rations	No soil gas > 10 ppb
A-54	Catch basins; water feed lot/watering area	Not SHARPE property; feedlot on adjacent land; SHARPE replaced drinking water well for landowner
A-1	Photographic Shop - Administration Bldg	Fuel UST near T-4; no contamination found
A-2	Photographic Shops/ Printing Plate Reproduction	Wastes to IWTP; covered during storm sewer survey

A-3	Blacksmith Shop	Iron and iron alloys used at this location; not expected to be environmental problems
A-6	Welding	No large scale use of solvents; soil gas < 10 ppb; no further assessment based on soil gas and nature of operation
PS-2	Paint Shop Storage	SWMU is a building; area paved; paint stored but not used at this site
A7	Sign Shop	SWMU is a building; building demolished; area paved; entire area around slab paved -no stains; covered during storm sewer investigation
A8 & A9	Reproduction	No material stored outside bldg; liquid wastes to IWTP; covered during storm sewer investigation; tank 8 (fuel UST) removed April 1988-no contamination; soild waste not hazardous-likely disposed in SB; soil gas < 10 ppb; Bldg 308 -fuel UST #33 removed March 1990-no remediation required based on sampling; UST #34 removed April 1990-remediation required - currently under SHARPE contract

Table 9-1. No Further Action Sites (Page 2 of 7)

Site/SWMU Number	Description	Comments
A11	Duplicating	No materials stored outside bldg; liquid wastes to IWTP; covered during storm sewer investigation; fuel UST 12 removed April 1990-remediation required and under SHARPE contract (1993-94)
A15	Water Plant and Water quality Laboratory	Soil gas < 10 ppb; liquid wastes to IWTP; covered during storm sewer investigation; fuel USTs 13 & 14 removed May and March 1990; neither required remediation based on sampling results
A18	Fire Station	Neither solid nor liquid HTW-generated; HM not used in significant quantities; extinguishers contained CC14; soil gas < 20 ppb; fuel UST removed prior to 1986; old tank site under building addition; SHARPE contract will install DG MW
S6	Former Taxi Dispatch	Small office used to dispatch taxis; building demolished in early 1970's soil gas < 20 ppb; paved surfaces around building; no reported releases or generation of HW
A-22	Radiator Repair Shop	Radiators drained prior to delivery; liquid wastes to IWTP; covered during sewer line investigation; solid wastes disposed through DPDO or landfilling/burning in SB area; area around bldg paved; UST 27 associated with this bldg; soil gas survey and downgradient monitoring wells discussed with S6
A35	Printing Shop	All wastes to IWTP; soil gas < 40 ppb; covered during sewer line investigation
A36-38	Brush Application of Oils for Preservation/ Welding	All wastes to IWTP; soil gas < 24 ppb; covered during sewer line investigation
A40	Gas Station	All tanks tight per tank test results; soil gas < 10 ppb; no inventory loss, therefore no further investigation required; USTs continuously monitored IAW Title 23 CCR

A48	Metals, plastic, piping work, silk screening	All wastes to IWTP; soil gas < 10 ppb; covered during sewer line investigation
A23-26	Support Shops for Electrical, Hydraulic, Misc. Repair	No sampling planned; SWMU is a building surrounded by concrete pavement; soil gas downgradient is < 100 ppb; within capture zone of NB treatment system; borings 100 feet south of bldg all clean; extraction well NA-10 within 50 feet; A23 drains to IWTP; covered during sewer line investigation; A24 contains PCB sump - sump has been drained and soil will be sampled beneath sump
S23	Defueling Facility	Large internally drained slab; rainwater drains to IWTP; covered during sewer line investigation; fuel drained from aircraft routed to two USTs (56,57); tanks removed April 1990; no remediation required based on sampling results; soil gas < ppb

Table 9-1. No Further Action Sites (Page 3 of 7)

Site/SWMU Number	Description	Comments
A12	Steam Cleaning/Wash Rack at Vehicle Maintenance Shop	No solid wastes generated at building; washwater routed to IWTP. Soil gas indicated that TCE is not present in detectable concentrations.
A5	Plumbing, painting, welding, pest control	No sampling per work plan; SWMU is a building; paved area; nearby tanks removed under SHARPE contract-remediate if required; soil boring and water results in PAR
A13	Metal shop; washrack	Monitoring wells in area; site characterized during sewer line investigation; SWMU is a building; soil gas (206 ppb); North Balloon capture zone
S4	Paint Spray Booth	Bldg no longer exists; paved area; runoff to IWTP; no A zone aquifer located adjacent to site; covered in sewer study; 2 borings for S31-188 ppm for lead at 15 ft; no VOCs in soil gas; North Balloon capture zone
A17	Ground stains ID from serial photo, large area in SB	"A" Text pages from work plan addendum; 8 soil borings - all ND; soil gas < 10 ppb in area -2156 ppm (100 ft away); see non-fuel UST discussion as separate issue. This site is targeted for soil gas characterization, as described in Section 9.2.1.
PS3	Motor pool; vehicle maintenance & storage	SWMU is a building; no sampling per work plan; paved area; no soil gas hits in area; wastes from area routinely disposed at other sites; North Balloon capture zone
A19	Heavy equipment engine shop	No sampling planned; SWMU is a former building; outside area paved; no soil gas hits downgradient; wastes drummed and disposed in other locations; extraction wells NA 4,9,10
S7	Sandblasting booths-performed in building	No sampling planned because SWMU is a building; outside area paved; no soil gas hits downgradient; wastes disposed in North Balloon area (S#26)

S8	Steam cleaning pad	Boring performed downgradient of slab (S8); no VOCs detected in capture zone of NB (well NA 5); wastes to IWTP -covered during sewer investigation
S9	Steam cleaning pad	3 borings in pad 669 (washrack); borings sampled for VOCs, semi-VOCs, metals; results insignificant; SB capture zone; contaminated rain water runoff discharged to IWTP
A20	Heavy Equip Component Repair Bldg	No sampling planned; SWMU is a building surrounded by concrete pavement; soil gas downgradient is < 100 ppb; see S27 for disposal within capture zone of NB treatment system; borings 100 feet south of bldg all clean; extraction well NA-10 within 50 feet
A21	Heavy Equip Repair; Vehicle Maint Bldg	No sampling planned; SWMU is a building surrounded by concrete pavement; soil gas downgradient is < 100 ppb; within capture zone of NB treatment system; borings 100 feet south of bldg all clean; extraction well NA-10 within 50 feet; see S27 for disposal of wastes

Table 9-1. No Further Action Sites (Page 4 of 7)

Site/SWMU Number	Description	Comments
A27	Support shop for electrical, hydraulic, W elding	Surface soil sample taken south of site; lead levels less than remediation levels (129ppm, at 0 to 6 in); soil gas 2156 ppb TCE & TCE ND in soil, South Balloon capture zone. This site is targeted for soil gas charcterization, as described in Section 9.2.1.
S10	Dip Tank	Dip Tank located outside near 174 washrack (S8); boring performed at site (S8); lead at 75ppm (o to 5ft); very low level VOC's detected; North Balloon capture zone (NA5)
A28	Parts cleaning/ stripping	No sampling planned for site per work plan; building & OWS demolished and removed in 1990 - including soil excavation to 25 feet at site; work performed by DieDe Construction; NA 10 nearby; within North Balloon capture zone
S11	Dip Tank for preservatives	Soil gas reading near 205 was 100 ppb; soil boring S11 installed to investigate soil gas - no contaminants site is indoor dip tank; 211 dip tank considered as A#37
A30	Cocooning Shed - preservatives	SWMU is a building; no sampling planned for site; soil gas in area < 100 ppb or > 16 ppb; no waste disposal here; waste taken to S28
A32-34	Storage of Lensatic Compasses	Indoor storage of lensatic compasses for issue to units; compasses not manufactured, repaired or calibrated; warehouses demolished in 1976
A39	Luminous dial sketching sets storage area	No sampling planned for this site; indoor warehouse storage of luminous sketching sets
A41	Cleaning, packaging, preservation of parts	No sampling planned for this site; indoor warehouse storage of various commodities; considered in stormdrain investigation
A42	Paint stripping on concrete slab and washrack	2 soil borings performed at this site, low-levels of BTEX detected (5 ppm) at 5 to 10 ft, ND at 10 to 15 ft; soil gas <100 ppb downgradient

A43	Metal stripping, degreasing, refinishing/paint booth	SWMU is a building; near PS4; 1 boring and 1 downgradient well installed (452A) sample taken from sump (PS 4); boring showed low level chloroform, MW ND; waste disposal see PS 4 & S28
A44-45	Liminous face wrist compass storage	No sampling planned; SWMU is a building where these items were stored (indoors)
S14	Stormwater liftstation sump: received stormwater from 380,403,659	No sampling planned; soil gas levels < 100 ppb; lift station for stormwater drainage currently in use; addressed by storm sewer survey
S15-17	Hazardous materials storage (for	No sampling planned; SWMU is building (materials stored inside); soil gas levels < 10 ppb; no waste generated at this site

Table 9-1. No Further Action Sites (Page 5 of 7)

Site/SWMU Number	Description	Comments
S18	Burning Pits	GPR performed to locate pit; soil boring in center of pit - no contamination detected; 1994 soil borings to 15 feet indicate Pb +Cr < PRGs
A46	Parts painting	No sampling planned; spray paint booth inside warehouse 486; soil gas < 25 ppb; part of storm sewer survey (IWTPS)
S19	Wash Apron	No sampling planned; soil gas < 10 ppb; part of storm sewer survey; within Central Area capture zone
A47	Packaging Building	SWMU is building where packaging of parts occurred; no soil sampling planned; high soil gas reading of 420 ppb; no waste disposed; near S35 & PS10. This site is targeted for soil gas characterization, as described in Section 9.2.1.
A49	Aircraft, minor repair	SWMU is shed where aircraft minor repair took place; paved area; no sampling planned; soil gas < 14 ppb or less; part of storm sewer survey; see IWTP & S34 for waste disposal
A50-52	Engine testing cells in buildings 611-613	SWMU is building where engine testing occurred; UST 47 removed 1990 - no contamination; OWS removed October 1993 - test results pending; soil gas < 10ppb
S20-22	Storage of flammable, compressed gases	No sampling planned; soil gas < 10ppb; flammable, compressed gases stored in these sheds; storage at 647 -see A17
PS6	Care & preservation; repair and storage area	SWMU is a building; Soil borings (2) installed near soil gas hits of 2200 ppb and 3000 ppb; no contamination found in borings in South Balloon capture zone
S24	Floor drains, wash rack, sumps	Paved, IWTP, elev. SG 1190 ppb, no contamination in 2 borings. This site is targeted for soil gas characterization, as described in Section 9.2.1.

S24	Floor drains, wash rack, sumps	Paved, IWTP, elev. SG 1190 ppb, no contamination in 2 borings. This site is targeted for soil gas characterization, as described in Section 9.2.1.
PS7	Battery shop; acid neutralization pit	1 boring at site-lead contamination at 10-15 ft (150 ppm); within capture zone of South Balloon treatment system; extraction wells (A8&A6) sampled for metals (non-detect)
S25	Chemical storage, processing & distribution	No sampling planned; soil gas < 10ppb; SWMU is building where chemical storage occurred; UST at site removed in 1990- no contamination found; no waste generated
S27	Waste Oil drained from care & preservation	Nine soil borings and 5 surface soil samples taken; no significant contamination found (minor BTEX contamination); soils in North Balloon frequently aerated due to heavy equipment tests in area within North Balloon capture zone; extraction well NA-10 within 50 feet

Table 9-1. No Further Action Sites (Page 6 of 7)

Site/SWMU Number	Description	Comments
PS8	Sandblasting wastes spread on ground	Four shallow borings in area (same borings as done for S28); no significant contamination found; 300 cubic yards of metals contaminated soil removed in 1988 adjacent to Bldg 605 (volume 3, appedix I, 1988 RI) per RCRA permit
S32	Solvent storage yard, S of IWTP oxidation pond	Boring in area; no significant contamination found; SG <10
S35	Drummed waste storage yard	High soil gas in area (> 1000 ppb); 4 borings at high soil gas location - no significant contamination; SWMU is completely contained within PS10. This site is targeted for soil gas characterization, as described in Section 9.2.1.
PS10	Open Storage Area	4 borings installed consistent with high soil gas; borings field screened with PID: 2 negative, 2 analyzed - no contamination found above detection limits
S37	Buried wreck helicopter	Soil gas < 10 ppb; buried with body parts; no sampling planned at this site; ground water in 415a show 0.6 ppb TCE
PS9	Storm sewers	Extensive storm sewer investigation performed conclude that the only analyte detected in soil gas was toluene. Soil samples analyzed for metals and VOCs were reported as non-detect.
PS11	PS11 is a combination of S12 & S32	See S12 and S32 above
PS12	Open storage in NB; combination of S26 & S27	See S26 and S27

PS13	Includes A57,A63,A72,A73; Open Storage Area	Ground stains indentified on serial photographs; 2 borings correspond to high soil gas locations (>1000 ppb) - no significant contamination found (results in 1988 RI); 404A clean; no evidence of contaminant sources. A portion of this site is targeted for soil gas characterization, as described in Section 9.2.1.
A57-63	Areas located around Bldg 649	Soil gas sampling performed in entire ground stain area; borings correspond to high soil gas readings (see PS 13); borings installed around Bldg 649 (seePS5); extraction wells located within and downgradient of these areas (A-7,8,B-1,C-1,A-1,3,5); MW cluster 418 downgradient
A55	Canvas shed, equipment overhaul, cleaning, welding	Soil gas < 10 ppb in area; no sampling per work plan
A56	Runway Extension (same as S34)	Same as S34

Table 9-1. No Further Action Sites (Page 7 of 7)

Site/SWMU Number	Description	Comments
A64-75	66,69,70,71,-PS 14; 67,-S26; 72,73-PS13	A64-Extraction well A3 & soil gas <100 ppb; A65 - MW 499C & soil gas < 100 ppb; A74 & A75 - soil gas < 10 ppb; A68 - groundstain near 404, see S35
A4	Sheet metal plumbing, painting	No sampling planned per work plan; paved area; SWMU is a building; no waste disposal; see IWTP; and S28
S31	Ground stain adjacent to building	North Balloon system capture zone; 4,9 being two borings, complete to 15 ft (at 5-ft intervals) were completed; maximum consituent reported was lead, reported as 188 mg/kg in one sample; quarterly sampling of nearby extraction wells NA-4, NA-9, and NA-10 have reported lead at concentrations below detection limits (0.005 µg/L); quaterly sampling was initiated in January 1994; this summary is based on data through six quaters.
A29	Wash rack	No sampling planned for site; soil gas in area > 16 ppb and < 100 ppb; non-fuel UST 70 removed Oct 1993 - site approved for closure by Board

The selected remedies for lead- and chromium-contaminated soils and TCE-contaminated soils satisfy the statutory requirement of Sec. 121 of CERCLA, as amended by SARA, in that the following mandates are attained:

1. The selected remedies are protective of human health and the environment;

2. The selected remedies comply with federal and state ARARs;

3. The selected remedies are cost effective in the fulfillment of the nine CERCLA evaluation criteria through remediation of the contaminated soil in a reasonable period of time;

4. The selected remedies utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and

5. The selected remedies satisfy the preference for treatments that reduce toxicity, mobility, or volume as principal elements for TCE-contaminated soils, and explain why this preference cannot be practicably satisfied for lead-and chromium-contaminated soils.

The following sections describe how the selected remedies satisfy each of the statutory requirements for each of the two selected alternatives.

10.1 LEAD-AND CHROMIUM-CONTAMINATED SOILS

10.1.1 PROTECTIVE OF HUMAN HEALTH AND ENVIRONMENT

The selected alternative is protective of human health and the environment in that soils in excess of cleanup standards would be removed from the site, through engineering controls. As described for Alternative 4B (Offsite Disposal), all soil with lead and chromium above cleanup standards will be excavated and disposed of at an offsite landfill. The action provides long-term effectiveness in that it will remove pathways which could cause exposure of the onsite adult worker to soils with levels of lead or chromium in excess of the cleanup standard. It is not possible to quantify the reduced risks associated with implementation of the alternative, as:

1. Chromium was not considered a factor in the HI calculations; and

2. There is currently no cancer slope factor available to calculate risks associated with lead.

The selected remedy will comply with all federal and state ARARs. No ARAR waivers will be necessary.

With proper planning and implementation, the remedial action which implements this alternative would comply with the following action-specific ARARs:

- Water Quality Control Plan (Basin Plan) for CVRWQC - Defines beneficial use levels for constituents in groundwater. Beneficial use levels for chromium and lead are equivalent to MCLs.
- State Water Resource Control Board Resolution No. 88-63, "Sources of Drinking Water Policy" as contained in the CVRWQCB Water Quality Control Plan -- Specifies that with certain exceptions, all ground and surface waters have the beneficial use of municipal or domestic water use.
- 22 CCR Div. 4.5, Chapter 14, Article 6, §§ 66264.90 et seq. -- Detection monitoring and evaluation monitoring programs for lead and chromium will be instituted with this program. If monitoring data indicates the beneficial uses of groundwater are not being protected, corrective action may be required.

ARARs are listed in Table 10-1.

10.1.3 COST EFFECTIVE

The selected remedy, offsite disposal, is cost-effective because it has been determined to provide overall effectiveness proportional to cost, the net present worth value being $683,000. Although more costly then the capping alternative ($388,000), the preferred alternative provides for permanent removal of waste from the site and more assurance of protection of human health and environment. Fixation/Solidification was the third most costly alternative, costing approximately $1,015,000 and involved keeping treated waste onsite under a cap requiring perpetual maintenance. The most costly alternative, Chemical Extraction/Soil Washing, was estimated to cost $1,773,000. There were no assurances that the technology is capable of achieving the cleanup standards established for cleanup.

Table 10-1. ARARs for Lead- and Chromium-Contaminated Soils

ARAR	DESCRIPTION	COMPLIANCE
Water Quality Control Plan (Basin Plan) for the RWQCB, CVR Applicable	Specific applicable portions of the Basin Plan include beneficial uses of affected water bodies and water quality objectives to protect those uses. Levels of constituents in residual contaminated soils that may affect water quality must not result in water quality exceeding water quality objectives.	The existing groundwater treatment systems are capturing and treating the VOC plume. All soils with designated levels of metals are located within capture zones of one of the three groundwater treatment plants.
Groundwater		will be monitored to assure the beneficial use of groundwater is protected.
22 CCR Div. 4.5, Chapter 14, Article 6 §§ 66264.90 et seq. Relevant and Appropriate	Requires monitoring to ensure there are no releases from waste management units. If releases are detected, appropriate corrective action must be taken to achieve compliance with water quality protection standards.	Groundwater downgradient of soils with designated levels of metals will be monitored to assure protection of the beneficial uses of groundwater.
State Water Resource Control Board Resolution No. 88-63, 'Sources of Drinking Water Policy" (as contained in the RWQCB's Water Quality Control Plan) Applicable	Policies adopted by the State and Regional Water Boards. Specifies that, with certain exceptions, all groundwater and surface waters have the beneficial use of municipal or domestic water supply.	Remediation of lead- and chromium-contaminated soils must also protect the beneficial uses of groundwater at SHARPE.

The parties to this Record of Decision do not agree on whether State Water Resources Control Board (SWRCB) Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304, June 1992, Resolution No. 9249 is an ARAR for this site. The State's position is that (SWRCB) Resolution No. 9249 is an applicable requirements for remedial actions for groundwater and soil where there is an impact, or threaten impact (including impacts from soils) to be beneficial uses of waters of the State. SHARPE has not identified Resolution No. 92-49 as an ARAR. The State, however, has decided not to dispute this decision since the action proposed by SHARPE will substantially comply with Resolution No. 9249.

Further, the Parties to this ROD do not agree fully on the citation of 22 CCR, Div 4.5, Chapter 14, Article 6, Section 66264.90 et seq. as an ARAR. The State's position is that the entire article is needed to determine specific monitoring and response actions. However, USEPA's position is that Article 6. in its entirety, is overly broad and not sufficiently specific to be considered an ARAR. Inclusion of the entire Article 6 in the ARARs table will not affect EPA's determination to be made under Section 9.1.4.

10.1.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT (OR RESOURCE RECOVERY) TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The selected remedy provides the best balance of tradeoffs among the alternatives evaluated with respect to the evaluation criteria. A comparison of the alternatives relative to one another is presented in Sec. 8.0. When compared to Alternatives 1C (Asphalt Cap), 2A (Fixation/Solidification), 2B (Chemical Extraction/Soil Washing), and 5A (No Action), on the basis of short-term effectiveness, long-term effectiveness, reduction of TMV, implementability, compliance with cleanup guidelines, and protection of human health and the environment, Alternative 4B (Offsite Disposal) was evaluated to be an equivalent or better alternative for soil remediation. Alternative 1C (Asphalt Cap) was not acceptable to the State. On the basis of cost, Alternative 4B (Offsite Disposal) was estimated to be the most cost-efficient of the state-accepted alternatives for achieving the remedial objectives for the site soil contamination. With the exception of Alternative 5A, the remaining four action alternatives comply with the threshold criteria of being protective of human health and the environment and ARAR compliant.

While the selected alternative does not include the use of alternative treatment technologies (or resource recovery technologies), it does provide for the most reliable permanent solution for lead- and chromium-contaminated soils onsite.

This alternative provides protection of human health and the environment by lowering the contaminant concentrations in the site soil. This alternative can achieve and comply with all ARARs.

The state has accepted the FS and endorses implementation of Alternative 4B (Offsite Disposal) to remediate lead- and chromium-contaminated soil.

The community did not comment on any of the remedial action alternatives.

10.1.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

Alternative 4B (Offsite Disposal) does not satisfy the statutory preference for treatment as a principal element. Alternatives 2A (Fixation/Solidification) and 219 (Chemical Extraction/Soil Washing), due to the technical complexity of the treatment methods, are not as reliable as Alternative 4B (Offsite Disposal) in the complete removal and reduction in health and environmental risk factors. The present value cost for Alternative 4B (Offsite Disposal) was also estimated to be significantly less than alternatives utilizing treatment.

10.2 TCE-CONTAMINATED SOILS

10.2.1 PROTECTIVE OF HUMAN HEALTH AND ENVIRONMENT

TCE-contaminated soils do not pose a risk to human health and the environment. Risks to exposure were calculated to be between the EPA recommended risk range of 10-4 to 10-6.HIs were estimated to be less than one. Implementation of the selected remedy, therefore, is not being recommended to decrease risks to human health and the environment. Rather, the selected remedy will minimize the amount of TCE allowed to migrate from contaminated soils to groundwater through treatment, and is a source removal action. Implementation of this alternative will not pose unacceptable risks or cross-media impacts. This alternative will reduce the amount of time and cost to remediate groundwater currently being treated under the authority of the groundwater ROD (OU1).

10.2.2 ARARs

The selected remedy will comply with all federal and state ARARs. No ARAR waivers are necessary.

With proper planning and implementation, the remedial action which implements this alternative would comply with the following action-specific ARARs:

- Air Pollution Control District Rules and Regulations (Rule 2201) - new emission sources must comply with implementation of Best Available Control Technology (BACT). Offgases from the treatment system will be treated with gas-phase carbon adsorption prior to being discharged to the atmosphere.

The following ARARs apply to areas where TCE-contaminated soils are determined to be a potential threat to water quality:

- Water Quality Control Plan (Basin Plan) for CVRWQCB - Defines beneficial use levels for constituents in groundwater. Beneficial Use levels for TCE are equivalent to MCLs.
- State Water Resource Control Board Resolution No. 88-63, "Sources of Drinking Water Policy" as contained in the CVRWQCB Water Quality Control Plan -- Specifies that with certain exceptions, all ground and surface waters have the beneficial use of municipal or domestic water use.
- 22 CCR Div. 4.5, Chapter 14, Article 6, §§ 66264.90 et seq.-- Detection monitoring and evaluation monitoring programs for TCE will be instituted with this program. If monitoring data indicates the beneficial uses of groundwater are not being protected, corrective action may be required,

ARARs are listed in Table 10-2.

10.2.3 COST EFFECTIVE

The selected remedy, ISV, is cost effective because it has been determined to provide overall effectiveness proportional to its cost, the net present worth value being $528,000. The estimated cost of the selected remedy was the least expensive alternative (with the exception of the no-action alternative), an order-of-magnitude less than the next-least-expensive alternative, Alternative 3A (LTTS) ($6,800,000), yet the selected alternative provides comparable treatment efficiencies without the need for excavating soils. Alternative 4A (Offsite Disposal), the second most costly alternative at $23,000,000, although more expensive, did not utilize treatment. The most expensive alternative, 2B (Onsite Incineration), with estimated costs two orders-of-magnitude greater than the selected remedy ($137,000,000), is more costly

without yielding a significantly greater treatment efficiency.

10.2.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT (OR RESOURCE RECOVERY) TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The selected remedy provides the best balance of tradeoffs among the alternatives evaluated with respect to the evaluation criteria. A comparison of alternatives relative to one another is presented in Sec. 8.0. When compared to Alternatives 2B (Onsite Incineration), 3A (LTTS), 4A (Offsite Disposal), and 5A (No Action), on the basis of short-term effectiveness, long-term effectiveness, reduction of TMV, implementability, compliance with cleanup guidelines, and protection of human health and the environment, Alternative 2C (ISV) was evaluated to be an equivalent or better alternative for TCE-contaminated soil remediation. On the basis of cost, Alternative 2C (ISV) was estimated to be the most cost-efficient means of achieving remedial objectives for the site soil contamination. Alternative 2C (ISV) has been evaluated on a pilot-scale at SHARPE and has been proven effective. Alternatives 2B (Onsite Incineration) and 3A (LTTS) would require treatability testing prior to implementation.

Table 10-2. ARARs for TCE-Contaminated Soils

ARAR	DESCRIPTION	COMPLIANCE
Air Pollution Control District Rules and Regulations (Rule 2201) Applicable	Specifies that new emission sources comply with implementation of Rest Available Control Technology (BACT).	Offgases, from the ISV VES systems will be treated with gas-phase carbon adsorption prior to being disd3arged to the atmosphere.
Water Quality Control Plan (Basin Plan) for the RWQCB, CVR Applicable	Specific applicable portions of the Basin Plan include beneficial uses of affected water bodies and water quality objectives to protect those uses. Levels of constituents in residual contaminated soils that may affect water quality must not result in water quality exceeding water quality objectives.	The existing groundwater treatment systems are capturing and treating the VOC plumes. Remediation will be conducted at locations where it is determined to be cost effective for treatment.
22 CCR Div. 4.5, Chapter 14, Article 6§§ 66264.90 et seq. Relevant and Appropriate	Requires monitoring to ensure them are no releases from waste management units. If releases are detected, appropriate corrective action must be taken to achieve compliance with water quality protection standards.	Groundwater downgradient of TCE source areas will be monitored to assess compliance with MCLs.
State Water Resource Control Board Resolution No. 88-63, "Sources of Drinking Water Policy" (as contained in the RWQCB's Water Quality Control Plan) Applicable	Policies adopted by the State and Regional Water Boards. Specifies that, with certain exceptions, all groundwater and surface waters have the beneficial use of municipal or domestic water supply.	Remediation of TCE-contaminated soils must protect the beneficial uses of groundwater at SHARPE. Remediation will be conducted at locations where it is determined to be cost effective for treatment.

The parties to this Record of Decision do not agree on whether State Water Resources Control Board (SWRCB) Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304, June IM, Resolution No. 92-49 is an ARAR for this site. The State's position is that SWRCB Resolution No. 92-49 is an applicable requirements for remedial actions for groundwater and soil where there is an impact, or threaten impact (including impacts from soils) to be beneficial uses of waters of the State. SHARPE has not identified Resolution No. 92-49 as an ARAR. The State, however, has decided not to dispute this decision since the action proposed by SHARPE will substantially comply with Resolution No. 92-49.

Further, the Parties to this ROD do not agree fully on the citation of 22 CCR, Div 4.5, Chapter 14, Article 6 Section 66264.90 et seq. as an ARAR. The State's position is that the entire article is needed to determine specific monitoring and response actions. However, USEPA's position is that Article 6, in its entirety, is overly broad and not sufficiently specific to be considered an ARAR. Inclusion of the entire Article 6 in the ARAs table will not affect EPA's determination to be made under Section 9.1.4.

The state has accepted the FS and endorses implementation of Alternative 2C (ISV) to remediate TCE-contaminated soil.

The community did not comment on any of the remedial action alternatives.

10.2.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

Alternative 2C (ISV) satisfies the statutory preference for treatment as a principal element. This alternative involves the installation of extraction wells to recover TCE vapors from soils. The TCE-laden vapor is transferred to gas-phase carbon, where the TCE is removed prior to the air being discharged to the atmosphere. Gas-phase carbon, when exhausted, is transported offsite to a commercial reactivation facility, where the carbon is regenerated and the TCE is destroyed.

11.0 REFERENCES

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Defense Distribution Region West - SHARPE Site
Lathrop, California

RESPONSIVENESS SUMMARY

1.0 OVERVIEW

At the time of the public comment period, Defense Distribution Region West (DDRW) recommended a preferred alternative in the Proposed Plan for remediation of contaminated soils at SHARPE in Lathrop, CA.

The preferred alternative:

- for lead and chromium contaminated soils involves excavation and off-site disposal of soils that represent a threat to human health;
- for trichloroethene (TCE) contaminated soils involves using in-situ volatilization to remove TCE from soils; treatment of these soils will be to a
- level practicable, and will consider the costs of soil treatment and costs of treating groundwater with the already operating groundwater treatment systems at SHARPE;
- for 111 SWMU's is No Further Action.

Because no comments were received during the public comment period, DDRW concluded that residents near SHARPE have no significant concerns regarding the selection and/or implementation of any of the alternatives investigated by DDRW to remediate contaminated soils.

2.0 BACKGROUND ON COMMUNITY INVOLVEMENT

Community interest in the SHARPE site dates to 1990 when SHARPE conducted the first technical review committee (TRC) meeting, at which representatives of the community were present. The TRC meeting was part of the Public Involvement Response Plan (PIRP), which was completed in June 1989. The TRC Charter was finalized in June 1990, the same month as the first TRC meeting. The last TRC meeting was held on February 4, 1993. A public meeting, detailing the preferred actions for this operable unit, was held on March 1, 1995.

3.0 SUMMARY OF PUBLIC COMMENTS

The public comment period was from February 22, 1995 to March 24, 1995. No comments were submitted by the public.